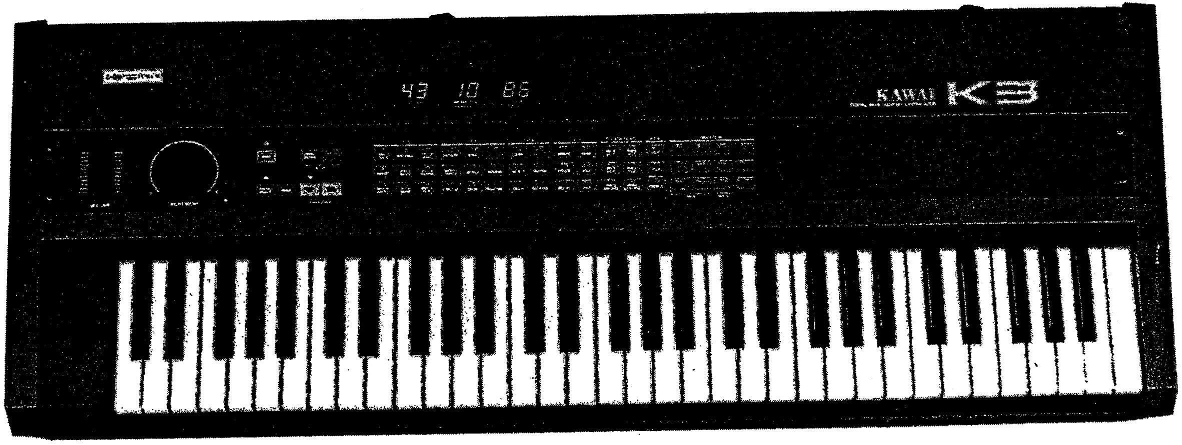
KAWAI

DIGITAL WAVE MEMORY SYNTHESIZER

K3

Service Manual



KAWAI Kawai Musical Instrument
Manufacturing Co., Ltd.

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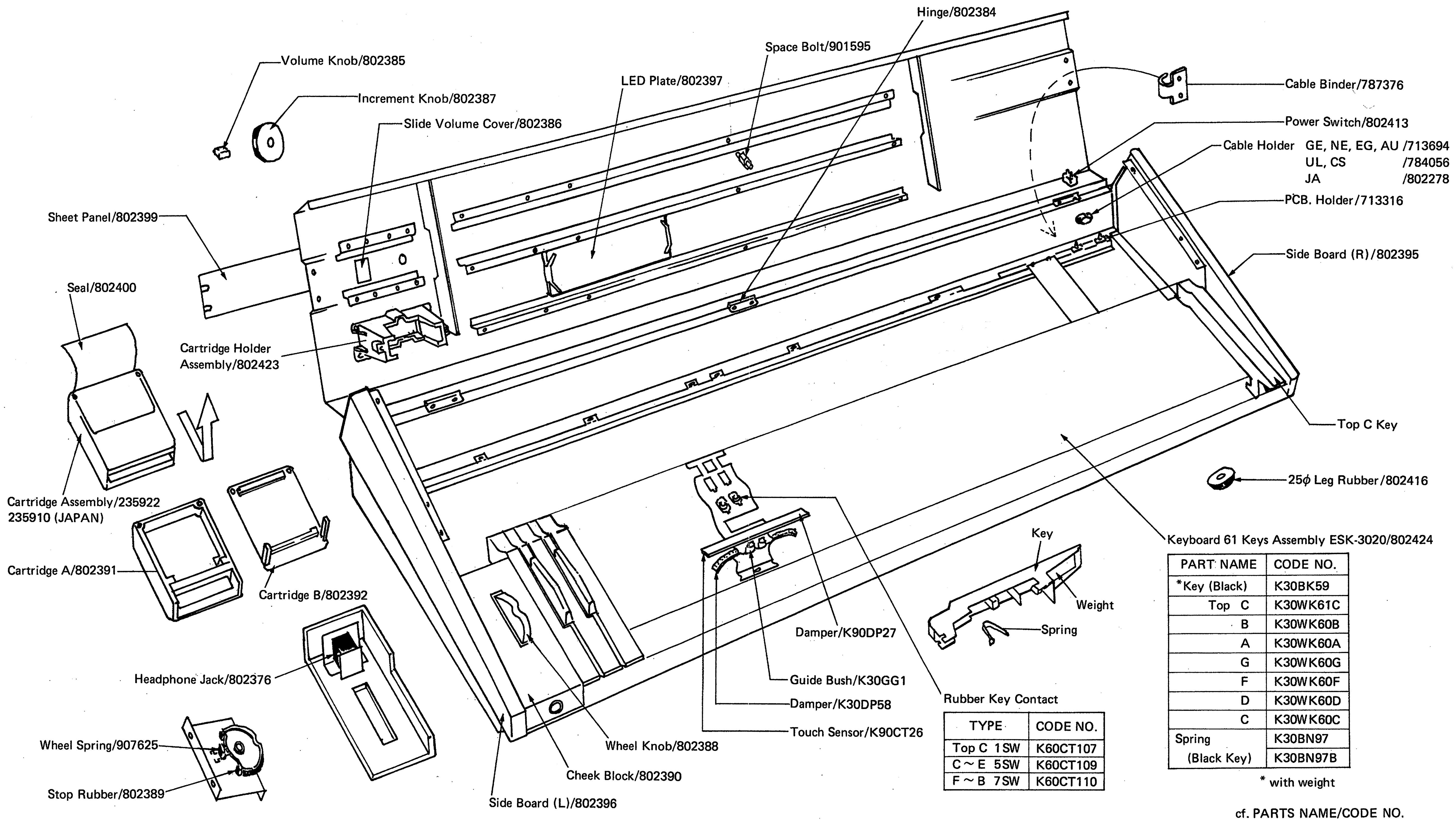
UNIT ASSEMBLY LAYOUT AND PARTS



Rubber Key Contact

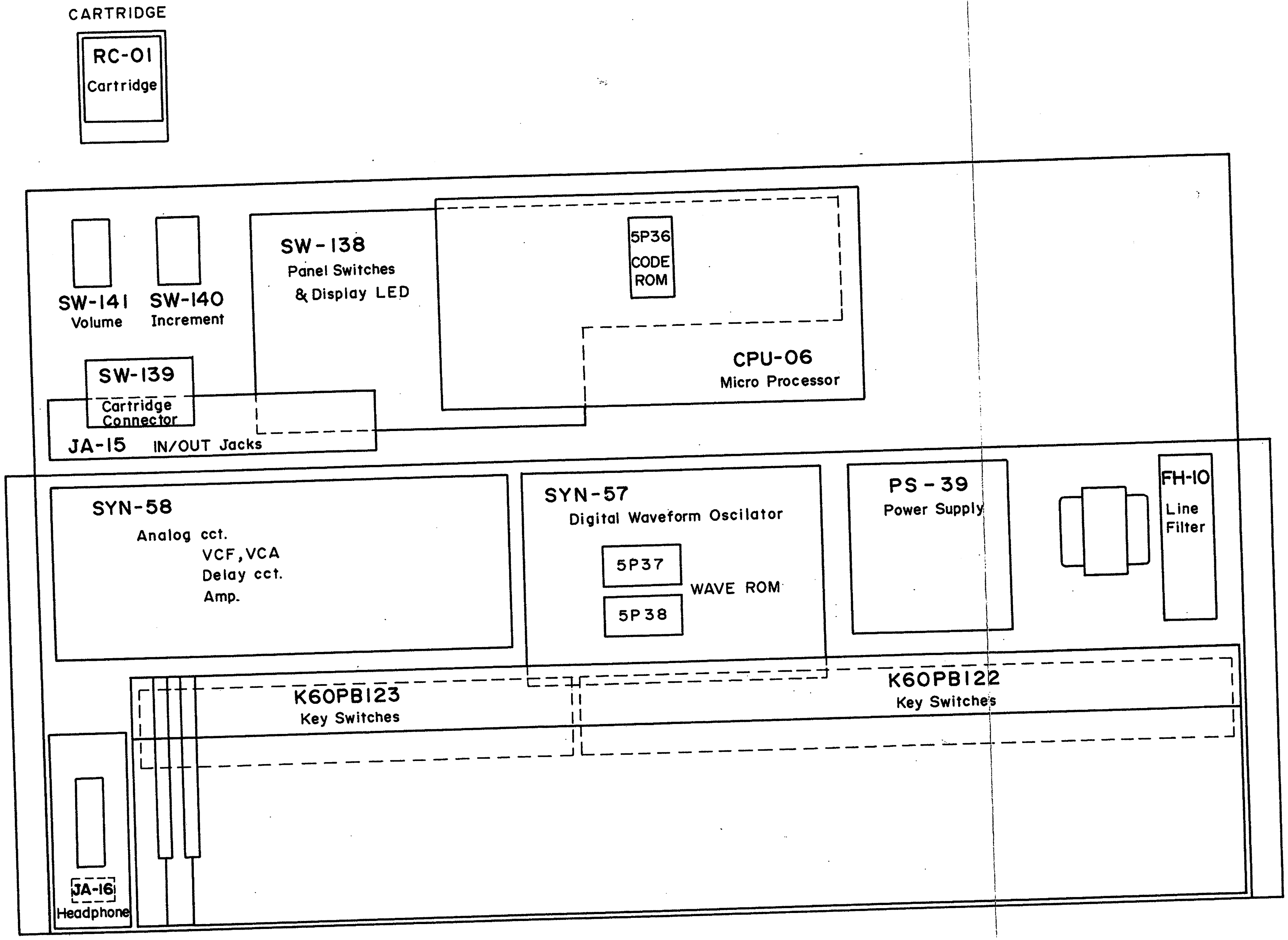
TYPE	CODE NO.
Top C 1SW	K60CT107
C ~ E 5SW	K60CT109
F ~ B 7SW	K60CT110

PART NAME	CODE NO.
*Key (Black)	K30BK59
Top C	K30WK61C
B	K30WK60B
A	K30WK60A
G	K30WK60G
F	K30WK60F
D	K30WK60D
C	K30WK60C
Spring	K30BN97
(Black Key)	K30BN97B

* with weight

cf. PARTS NAME/CODE NO.

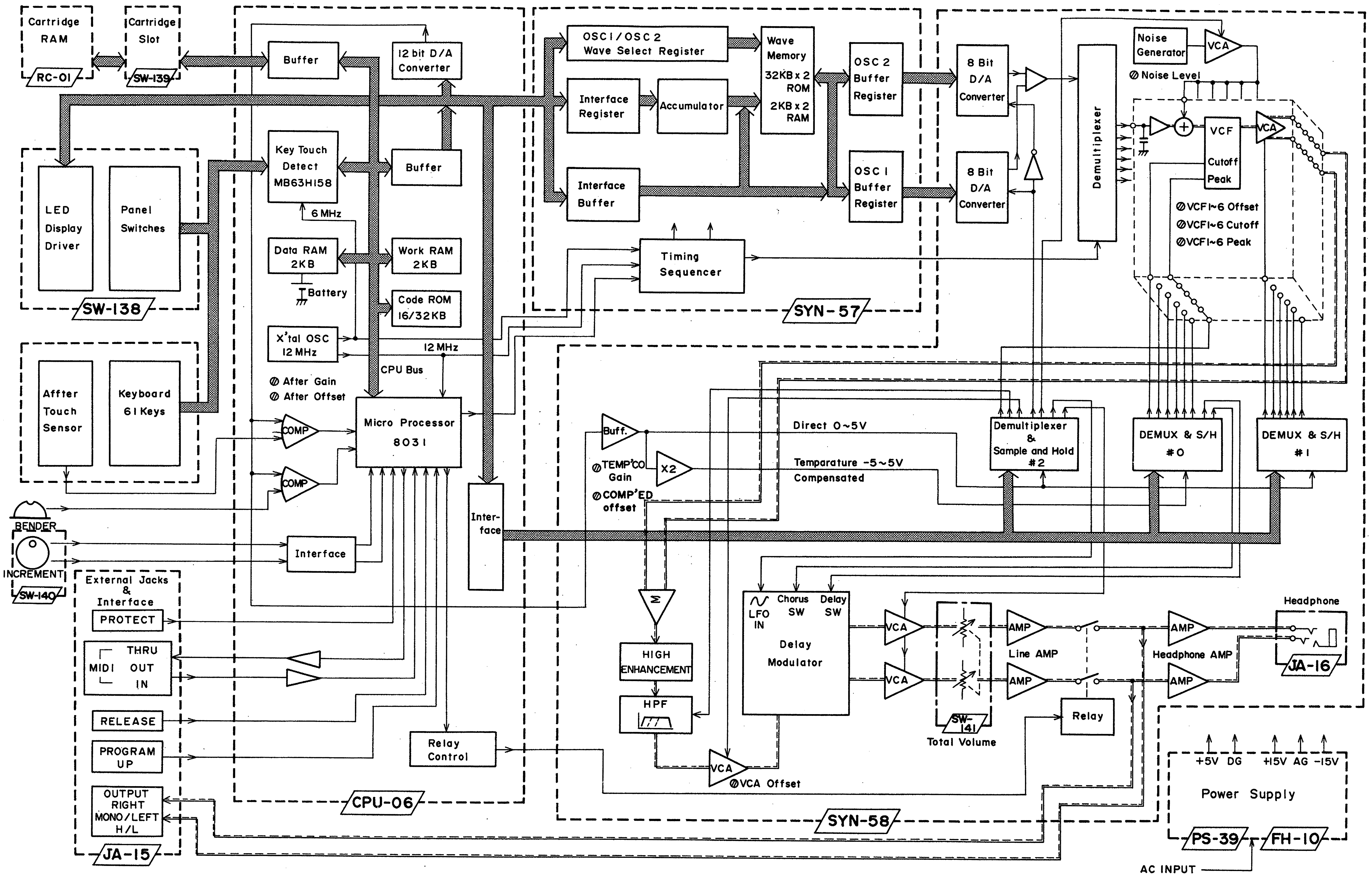
P.C.B. LAYOUT



P.C.B. LIST

DESCRIPTION	CODE NO.	REMARKS
SYN-57 PCB	907545	
SYN-57 Assembly	235904	
SYN-58 PCB	907550	
SYN-58 Assembly	235905	
CPU-06 PCB	907555	
CPU-06 Assembly	235906	
JA-16, SW-138, 139, 140, 141 PCB	907570	
JA-16,SW-138,139,140,141,Assembly	235909	
RC-01 PCB	907560	
Cartridge Assembly	235922	
"	235910	Japan
FH-10, JA-15, PS-39 PCB	907565	
FH-10, JA-15, PS-39 Assembly	235911	General
"	235912	NE
"	235913	UL
"	235914	CS
"	235908	Japan
Key Switches	K60PB123	
"	K60PB122	

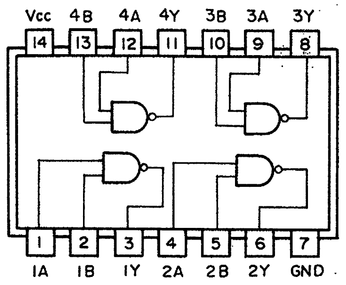
BLOCK DIAGRAM



TTL CIRCUITS PIN ASSIGNMENTS (TOP VIEWS)

74LS00 (Code No. 800720)

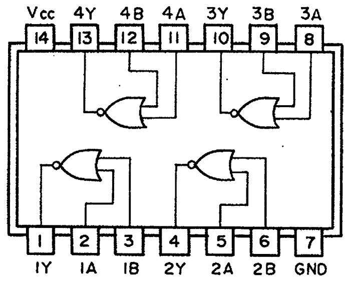
QUADRUPLE 2-INPUT
POSITIVE-NAND GATES



Positive logic:
Y = $\overline{AB}$

74LS02 (Code No. 800721)

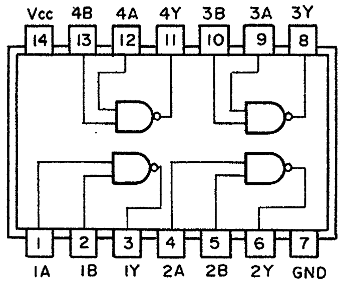
QUADRUPLE 2-INPUT
POSITIVE-NOR GATES



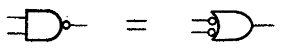
Positive logic:
Y = $\overline{A+B}$

74LS03 (Code No. 706951)

QUADRUPLE 2-INPUT
POSITIVE-NAND GATES
WITH OPEN-COLLECTOR OUTPUTS

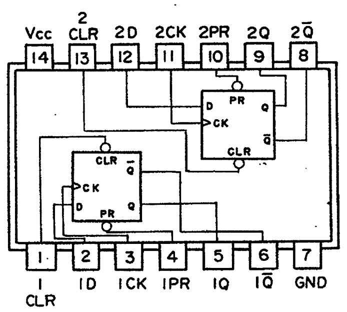


Positive logic:
Y = $\overline{AB}$



74LS74AN (Code No. 706927)

DUAL D-TYPE POSITIVE-EDGE-TRIGGERED
FLIP-FLOPS WITH PRESET AND CLEAR

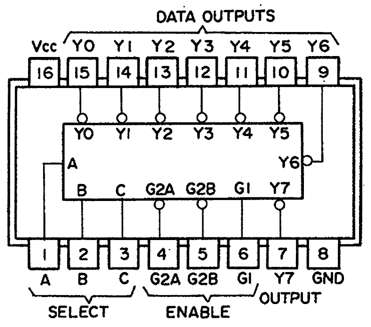


FUNCTION TABLE

INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H°	H°
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\overline{Q}_0$

74LS138 (Code No. 706939)

3-TO 8-LINE DECODERS /MULTIPLEXERS



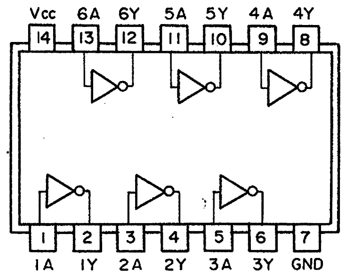
'LS138,
FUNCTION TABLE

INPUTS					OUTPUTS							
ENABLE		SELECT										
G1	G2*	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

*G = G2A + G2B
H = high level, L = low level, X = irrelevant

74LS04 (Code No. 706957)

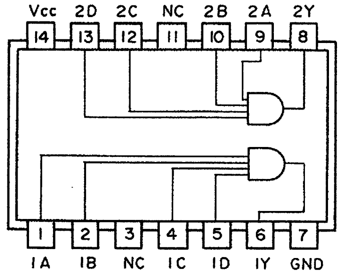
HEX. INVERTERS



Positive logic:
Y = $\overline{A}$

74LS21 (Code No. 802236)

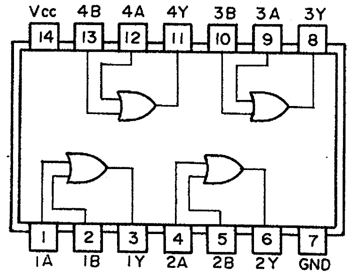
DUAL 4-INPUT
POSITIVE-AND GATES



Positive logic:
Y = ABCD

74LS32 (Code No. 706914)

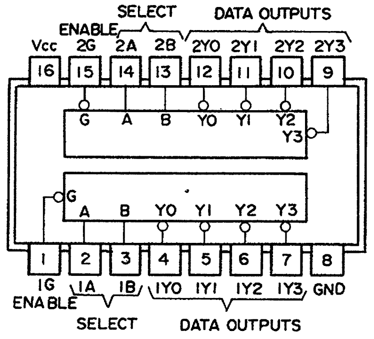
QUADRUPLE 2-INPUT
POSITIVE-OR GATES



Positive logic:
Y = A+ B

74LS139 (Code No. 800807)

DUAL 2-TO 4-LINE DECODERS /MULTIPLEXERS



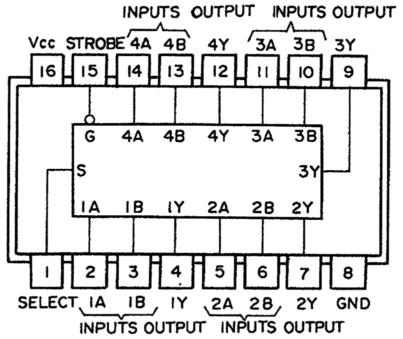
'LS139,
(EACH DECODER/DEMULTIPLEXER)
FUNCTION TABLE

INPUTS			OUTPUTS			
ENABLE	SELECT					
G	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

H=high level, L=low level, X=irrelevant

74LS158 (Code No. 802409)

INVERTED DATA OUTPUTS /MULTIPLEXERS
QUAD 2-TO 1-LINE DATA SELECTORS


INPUTS OUTPUT INPUTS OUTPUT
Vcc STROBE 4A 4B 4Y 3A 3B 3Y
16 15 14 13 12 11 10 9
G 4A 4B 4Y 3A 3B
S 3Y
1A 1B 1Y 2A 2B 2Y
1 2 3 4 5 6 7 8
SELECT 1A 1B 1Y 2A 2B 2Y GND
INPUTS OUTPUT INPUTS OUTPUT

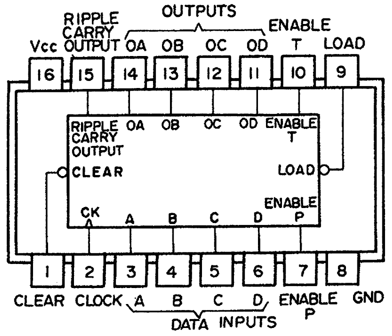
FUNCTION TABLE

INPUTS				OUTPUT Y
STROBE	SELECT	A	B	'LS158
H	X	X	X	H
L	L	L	X	H
L	L	H	X	L
L	H	X	L	H
L	H	X	H	L

H = high level, L = low level, X = irrelevant

74LS161 (Code No. 800756)

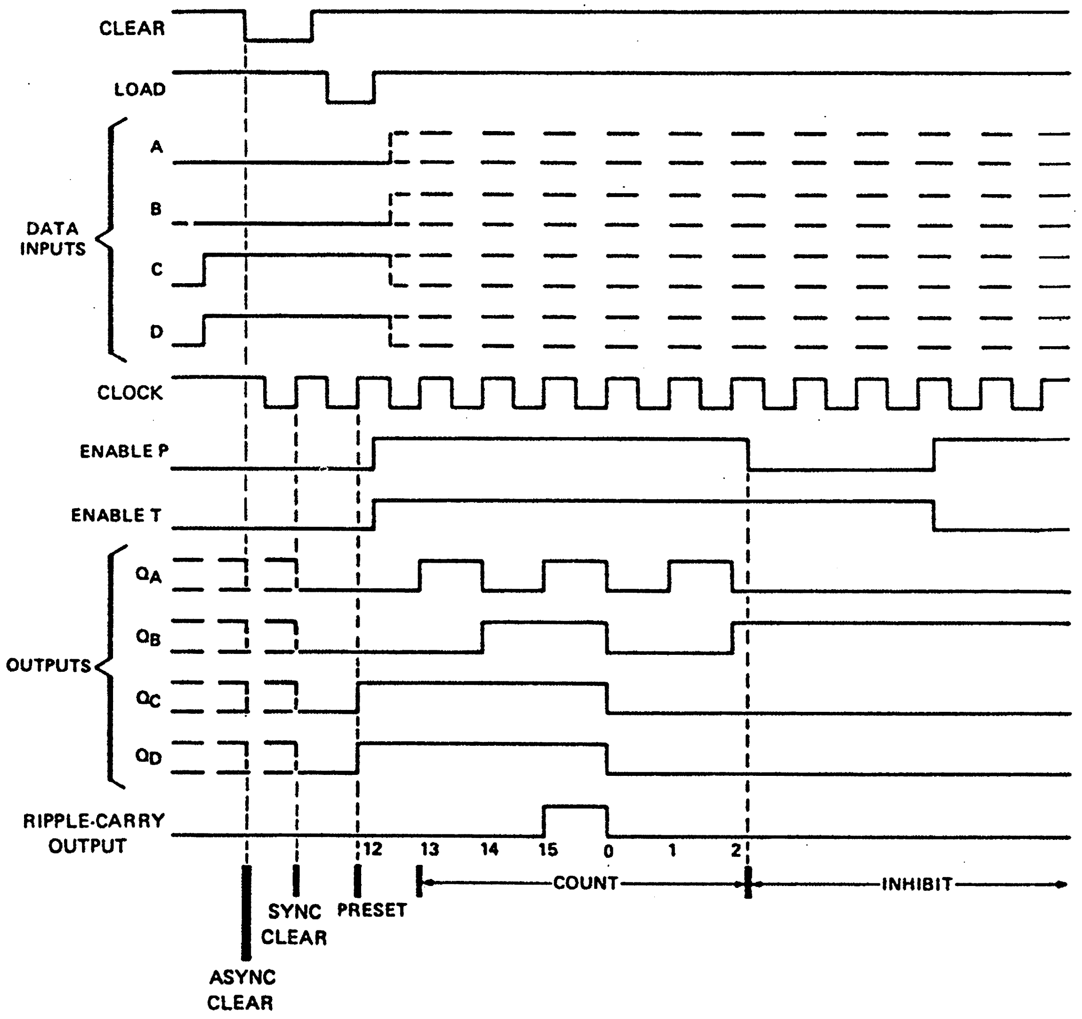
SYNCHRONOUS 4-BIT COUNTERS BINARY, DIRECT CLEAR



typical clear, preset, count, and inhibit sequences

Illustrated below is the following sequence:

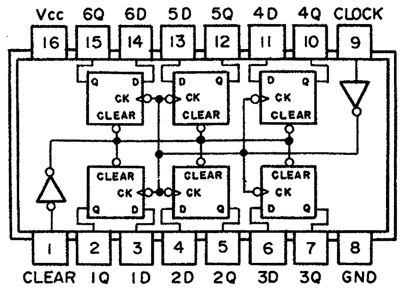
1. Clear outputs to zero (asynchronous)
2. Preset to binary twelve
3. Count to thirteen, fourteen fifteen, zero, one, and two
4. Inhibit



74LS174 (Code No. 707008)

HEX. D-TYPE FLIP-FLOPS

SINGLE RAIL OUTPUTS
COMMON DIRECT CLEAR



FUNCTION TABLE
(EACH FLIP-FLOP)

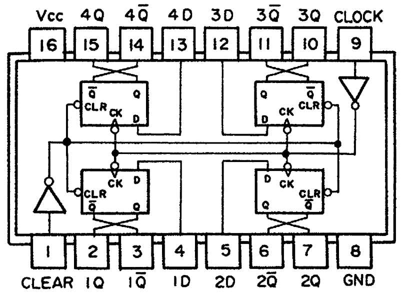
INPUTS			OUTPUTS	
CLEAR	CLOCK	D	Q	$\bar{Q}$†
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q_0	$\bar{Q}_0$

H = high level (steady state)
L = low level (steady state)
X = irrelevant
↑ = transition from low to high level
Q_0= the level of Q before the indicated steady-state input conditions were established.
† = 'LS175, only

74LS175 (Code No. 800719)

QUAD D-TYPE FLIP-FLOPS

COMPLEMENTARY OUTPUTS
COMMON DIRECT CLEAR



FUNCTION TABLE
(EACH FLIP-FLOP)

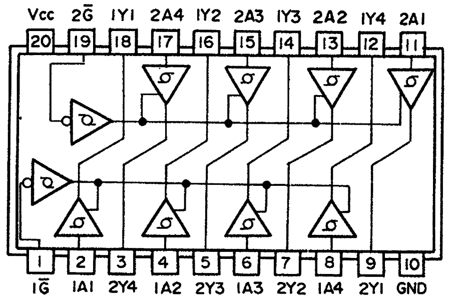
INPUTS			OUTPUTS	
CLEAR	CLOCK	D	Q	$\bar{Q}$†
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q_0	$\bar{Q}_0$

H = high level (steady state)
L = low level (steady state)
X = irrelevant
↑ = transition from low to high level
Q_0= the level of Q before the indicated steady-state input conditions were established.
† = 'LS175, only

74LS244 (Code No. 800675)

OCTAL BUFFERS/LINE DRIVERS /LINE RECEIVERS

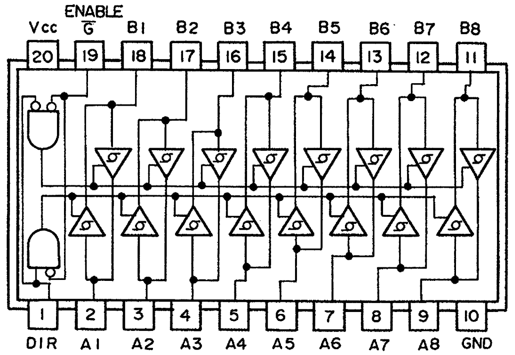
NONINVERTED 3-STATE OUTPUTS



74LS245 (Code No. 706948)

OCTAL BUS TRANSCEIVERS

NONINVERTED 3-STATE OUTPUTS



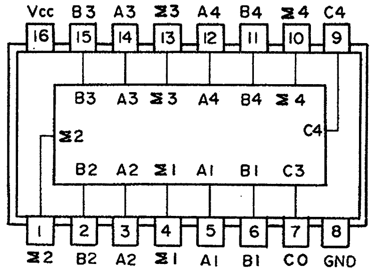
FUNCTION TABLE

ENABLE G̅	DIRECTION CONTROL DIR	OPERATION
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H=high level, L=low level, X=irrelevant

74LS283 (Code No. 802352)

4-BIT BINARY FULL ADDERS



FUNCTION TABLE

INPUT				OUPUT					
				WHEN C0=L / WHEN C2=L			WHEN C0=H / WHEN C2=H		
A1 / A3	B1 / B3	A2 / A4	B2 / B4	Σ1 / Σ3	Σ2 / Σ4	C2 / C4	Σ1 / Σ3	Σ2 / Σ4	C2 / C4
L	L	L	L	L	L	L	H	L	L
H	L	L	L	H	L	L	L	H	L
L	H	L	L	H	L	L	L	H	L
H	H	L	L	L	H	L	H	H	L
L	L	H	L	L	H	L	H	H	L
H	L	H	L	H	H	L	L	L	H
L	H	H	L	H	H	L	L	L	H
H	H	H	L	L	L	H	H	L	H
L	L	L	H	L	H	L	H	H	L
H	L	L	H	H	H	L	L	L	H
L	H	L	H	H	H	L	L	L	H
H	H	L	H	L	L	H	H	L	H
L	L	H	H	L	L	H	H	L	H
H	L	H	H	H	L	H	L	H	H
L	H	H	H	H	L	H	L	H	H
H	H	H	H	L	H	H	H	H	H

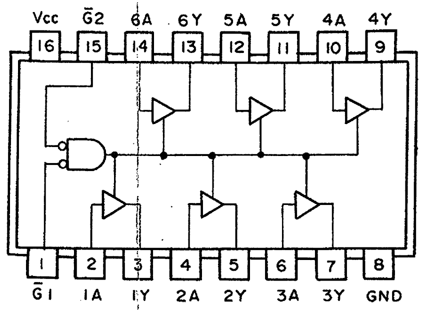
H = high level, L = low level

NOTE: Input conditions at A1, B1, A2, B2, and C0 are used to determine outputs Σ1 and Σ2 and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs Σ3, Σ4, and C4.

74LS365 (Code No. 800793)

HEX BUS DRIVERS

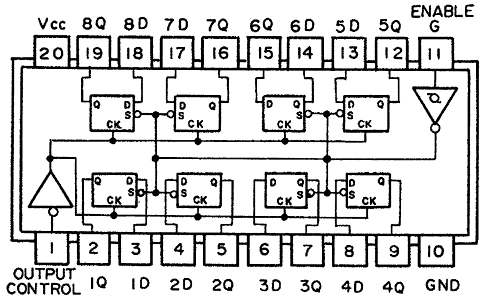
3-STATE OUTPUTS
NONINVERTED DATA OUTPUTS
GATED ENABLE INPUTS



74LS373 (Code No. 706929)

OCTAL D-TYPE LATCHES

3-STATE OUTPUTS
COMMON OUTPUT CONTROL
COMMON ENABLE


Vcc 8Q 8D 7D 7Q 6Q 6D 5D 5Q ENABLE G
20 19 18 17 16 15 14 13 12 11
1 2 3 4 5 6 7 8 9 10
OUTPUT CONTROL 1Q 1D 2D 2Q 3D 3Q 4D 4Q GND

'LS373
FUNCTION TABLE

OUTPUT CONTROL	ENABLE G	D	OUTPUT
L	H	H	H
L	H	L	L
L	L	X	Q_0
H	X	X	Z

74LS374 (Code No. 800714)

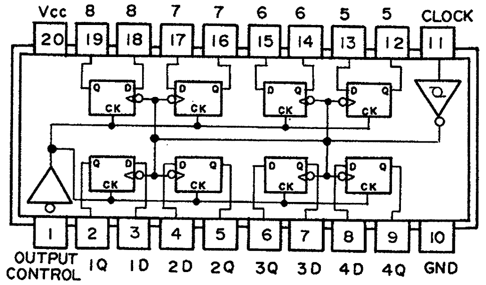
OCTAL D-TYPE FLIP-FLOPS

3-STATE OUTPUTS
COMMON OUTPUT CONTROL
COMMON CLOCK

74ALS374 (Code No. 802353)

OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS

ADVANCED LOW-POWER SCHOTTKY TRANSISTOR-TRANSISTOR LOGIC


Vcc 8 8 7 7 6 6 5 5 CLOCK
20 19 18 17 16 15 14 13 12 11
1 2 3 4 5 6 7 8 9 10
OUTPUT CONTROL 1Q 1D 2D 2Q 3Q 3D 4D 4Q GND

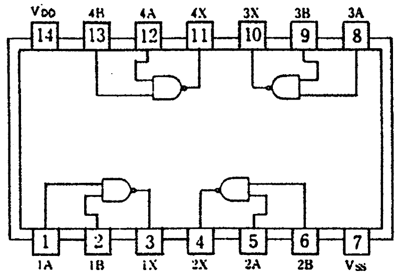
'LS374
FUNCTION TABLE

OUTPUT CONTROL	CLOCK	D	OUTPUT
L	↑	H	H
L	↑	L	L
L	L	X	Q_0
H	X	X	Z

CMOS LOGIC CIRCUITS PIN ASSIGNMENTS (TOP VIEWS)

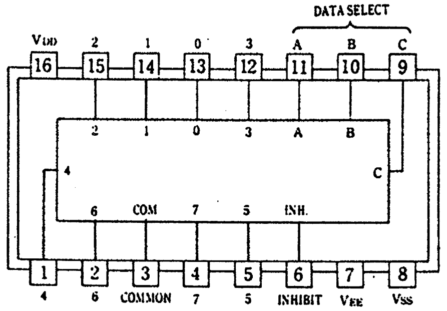
4011B (Code No. 706982)

QUAD 2-INPUT POSITIVE NAND GATE



4051B (Code No. 706984)

SINGLE 8-CHANNEL MULTIPLEXER /DEMULTIPLEXER



TRUTH TABLE

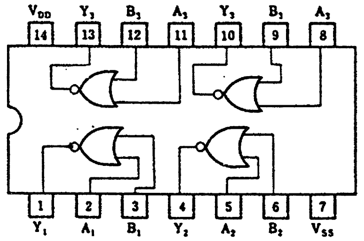
CONTROL INPUTS				"ON" CHANNEL
INHIBIT	C	B	A	4051B
L	L	L	L	0
L	L	L	H	1
L	L	H	L	2
L	L	H	H	3
L	H	L	L	4
L	H	L	H	5
L	H	H	L	6
L	H	H	H	7
H	*	*	*	NONE

* Don't Care

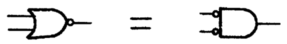
HIGH-SPEED CMOS LOGIC CIRCUITS PIN ASSIGNMENTS (TOP VIEWS)

74HC02 (Code No. 802354)

QUAD 2-INPUT NOR GATE

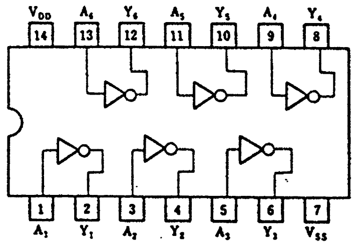


$Y = \overline{A+B}$



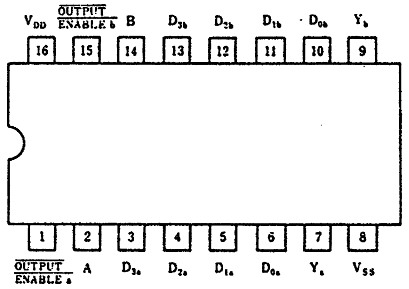
74HC04 (Code No. 802355)

HEX. INVERTER



74HC153 (Code No. 802046)

DUAL 4-INPUT DATA SELECTOR /MULTIPLEXER



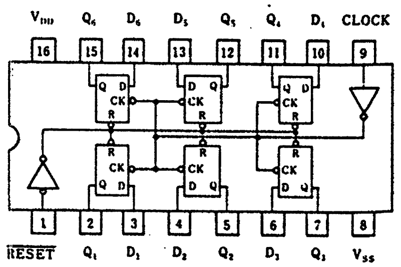
TRUTH TABLE

INPUT			OUTPUT
Select		$\overline{\text{OUTPUT ENABLE}}$	Y
A	B		
×	×	H	L
L	L	L	D_0
L	H	L	D_1
H	L	L	D_2
H	H	L	D_3

H: High level L: Low level x: H or L

74HC174 (Code No. 802239)

HEX. D-TYPE FLIP-FLOP



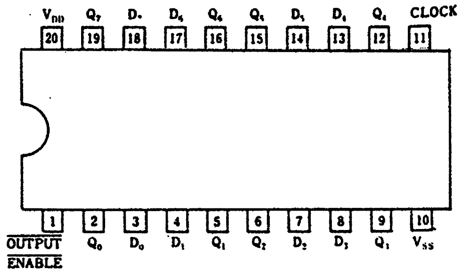
TRUTH TABLE

INPUT			OUTPUT
$\overline{\text{RESET}}$	CLOCK	DATA (D)	Q
L	×	×	L
H	↑	H	H
H	↑	L	L
H	L	×	NO CHANGE

H: High level L: Low level x: H or L

74HC374 (Code No. 801928)

OCTAL D-TYPE FLIP-FLOP WITH 3-STATE



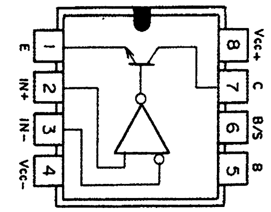
TRUTH TABLE

INPUT			OUTPUT
$\overline{\text{OUTPUT ENABLE}}$	CLOCK	DATA D	Q
L	↑	H	H
L	↑	L	L
L	↓	×	No change
H	×	×	Z

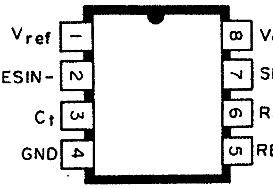
H: High level L: Low level x: H or L Z: High impedance

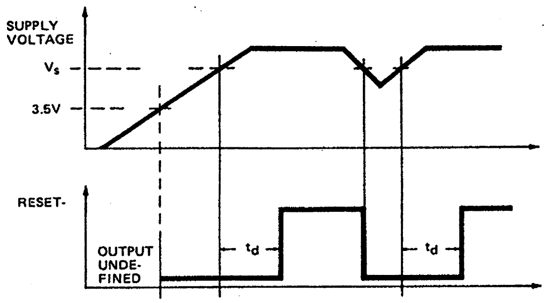
CPU-06, SW-139, SW-140 TERMINALS INFORMATION

LM311
DIFFERENTIAL COMPARATORS WITH STROBES



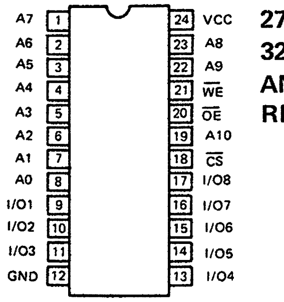
TL7705C
SUPPLY VOLTAGE SUPERVISOR



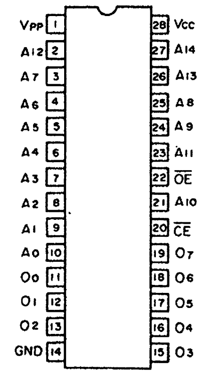


LC3517NL-20 (Code No. 802356)
MB8416A-15L-SK-G (Code No. 802043)
16384-BIT CMOS STATIC RANDOM ACCESS MEMORY

(TOP VIEW)



27256
32768-WORD x 8-BIT UV ERASABLE AND PROGRAMMABLE READ ONLY MEMORY

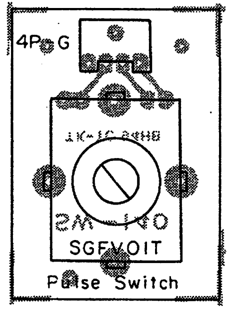


(TOP VIEW)

D. GRND

IC Socket
DICF-28C

CN-1			
CPU-06			
DG	+5D	INCO	INC1



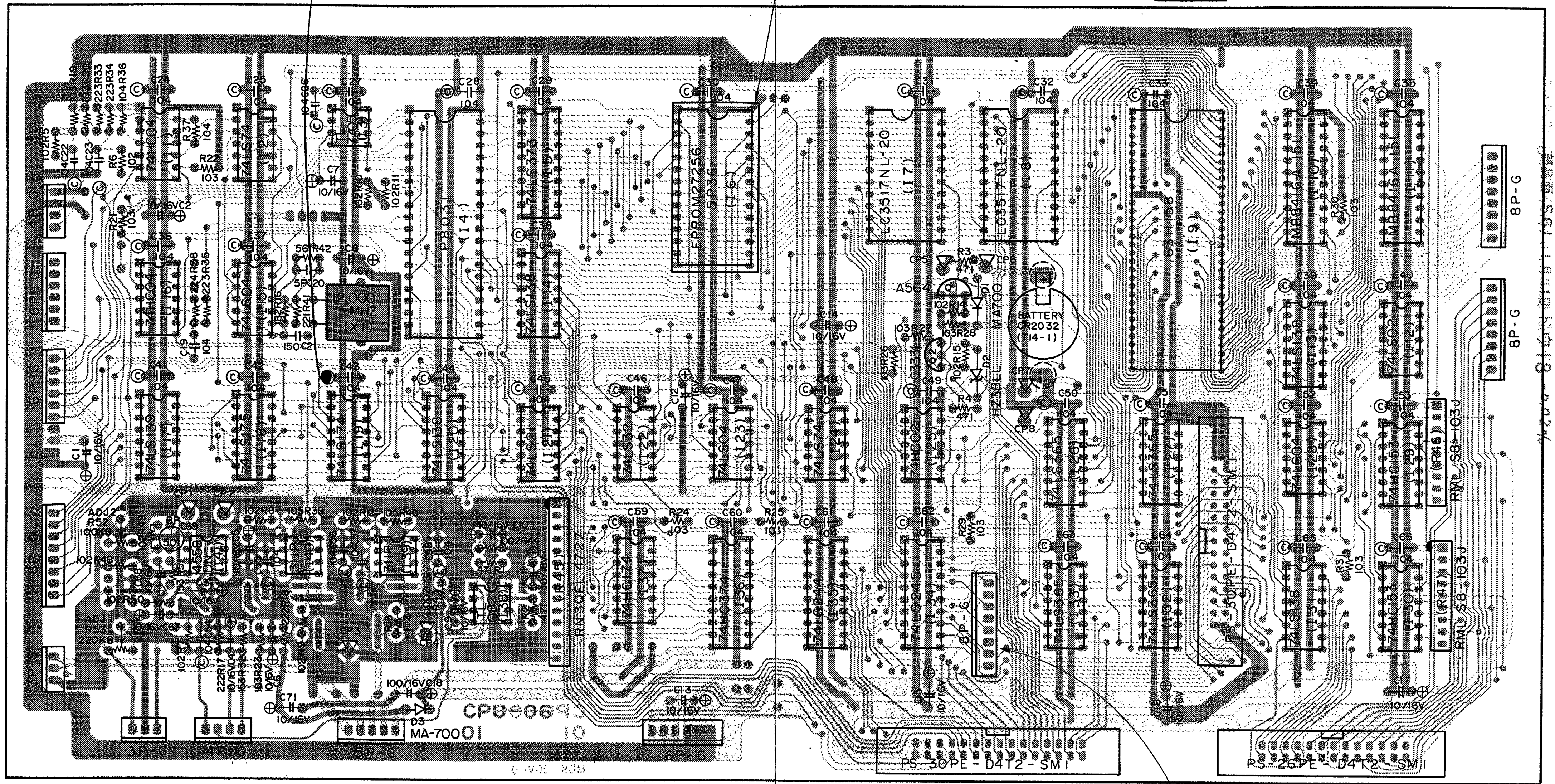
		CN-1
INCREMENT	SW-140	DG
		+5D
		INCO
		INC1

		CN-2
CN-2	SW-138	LED3
		LED2
		LED1
		LED0
		WR2
		WR1

		CN-3
CN-3	JA-15	PRTC
		MDOT
		MDIN
		PRGU
		REL S
		RELY

		CN-4
CN-5	SYN-58	SEL A
		SEL B
		SEL C
		INH 0
		INH 1
		INH 2
		SINH
		RELY

		CN-5
CN-4	SYN-58	GARD
		ANLG
		AG

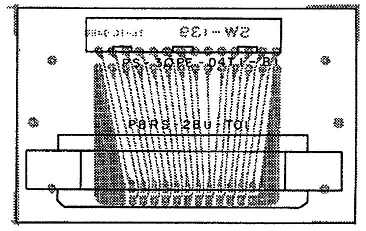


CN-13		
PA0	SW-138	CN-4
PA1		
PA2		
PA3		
PA4		
PA5		
PA6		
PA7		

CN-12		
PD0	SW-138	CN-5
PD1		
PD2		
PD3		
PD4		
PD5		
PD6		
PD7		

+5D	+5D	SW-139	CN-1
ME	+5D		CARTRIDGE
A8	A7		
A9	A6		
A10	A5		
A3	A4		
D7	A2		
D6	A1		
D5	A0		
D4	D0		
D3	D1		
OE	D2		
CE	WE		
DG	DG		
DG	DG		

CN-14														
CPU-06														
+5D	+5D	A7	A6	A5	A4	A2	A1	A0	D0	D1	D2	WE	DG	DG
+5D	ME	A8	A9	A10	A3	D7	D6	D5	D4	D3	OE	CE	DG	DG



+5D	A7	A6	A5	A4	A3	A2	A1	A0	D0	D1	D2	WE	DG
ME	A8	A9	A10	NC	NC	NC	D7	D6	D5	D4	D3	OE	CE
RC-01													
CARTRIDGE													

CN-6		
AFTR	AG	APS
PRES.S		
KEY-BOARD		

CN-7			
BNDR	CREF	BHS	BLS
BENDER			

CN-8				
AG	+15	−15	5AG	+5A
PS-39				
CN-1			CN-2	

CN-9					
DG	DG	DG	+5D	+5D	+5D
PS-39	SW-138	NC		SW-138	PS-39
CN-2	CN-3			CN-3	CN-2

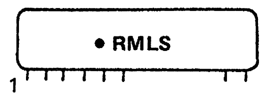
CN-10														
DG	DG	12M	WR	CS1	D0	D2	D4	D6	A0	A2	A4	A6	A8	A10
DG	DG	6M	P34	CS0	CS2	D1	D3	D5	A7	A1	A3	A5	A7	A9
SYN-57														
CN-4														

CN-15		
D0	SW-138	CN-1
D1		
D2		
D3		
D4		
D5		
D6		
D7		

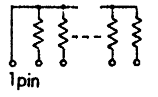
KA1	KA3	KA5	KA7	KD14	KD15	KD16	KD17	KD20	KD21	KD22	KD23
KA0	KA2	KA4	KA6	KD13	KD12	KD11	KD10	KD27	KD26	KD25	KD24
KEYBOARD											

Cf © Ceramic Capacitor

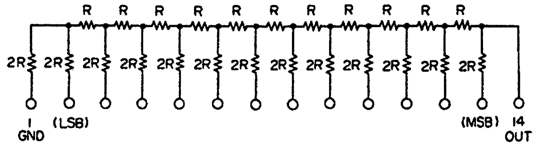
RESISTOR MODULE



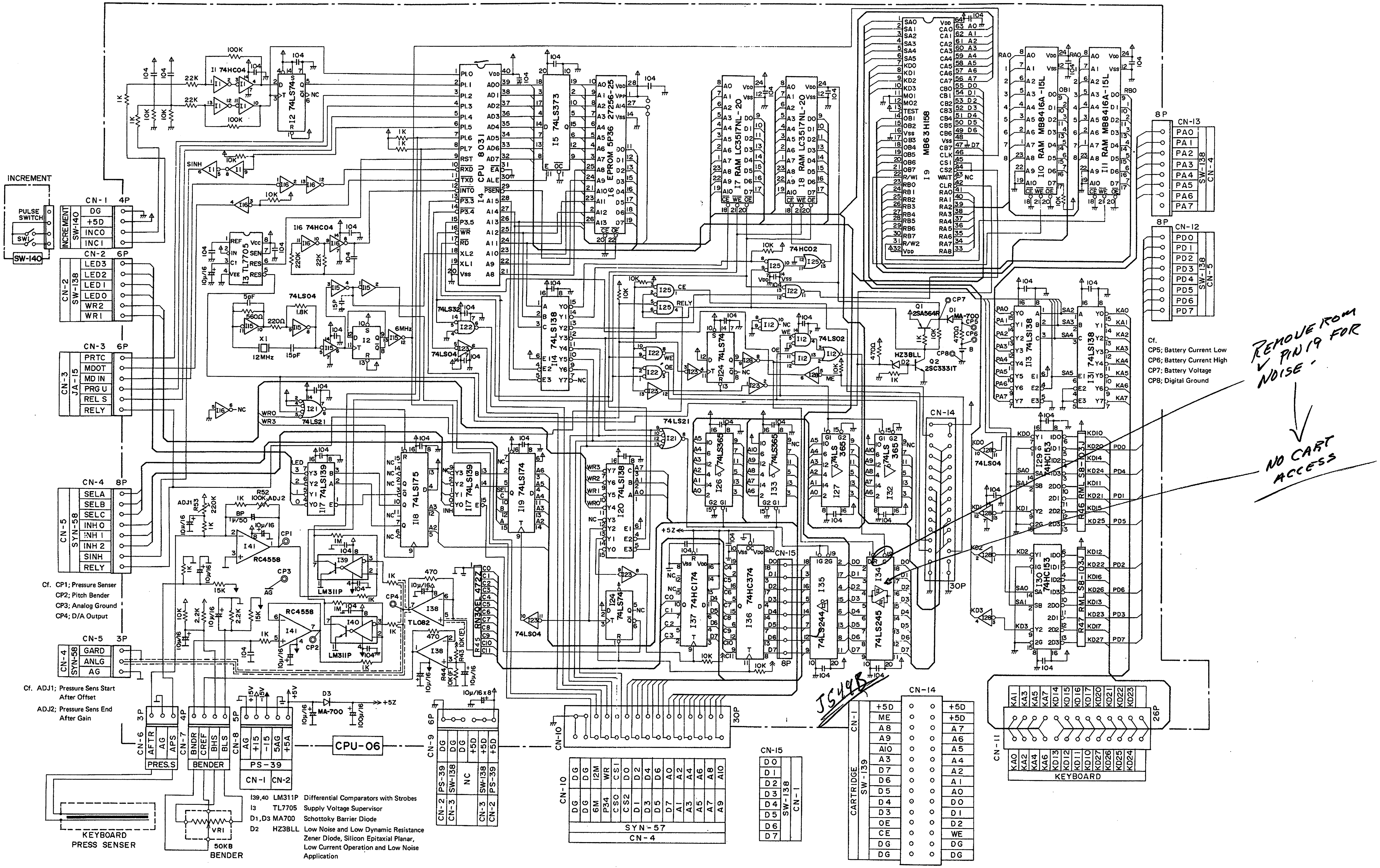
RMLS8-332J
472J
103J
RMLS4-472J



Ladder Network Resistor Module
RN3Q EL472Z



CPU-06, SW-140 CIRCUIT DIAGRAM



Cf. CP1; Pressure Senser
CP2; Pitch Bender
CP3; Analog Ground
CP4; D/A Output

Cf. ADJ1; Pressure Sens Start After Offset
ADJ2; Pressure Sens End After Gain

I39,40	LM311P	Differential Comparators with Strobes
I3	TL7705	Supply Voltage Supervisor
D1,D3	MA700	Schottky Barrier Diode
D2	HZ3BLL	Low Noise and Low Dynamic Resistance Zener Diode, Silicon Epitaxial Planar, Low Current Operation and Low Noise Application

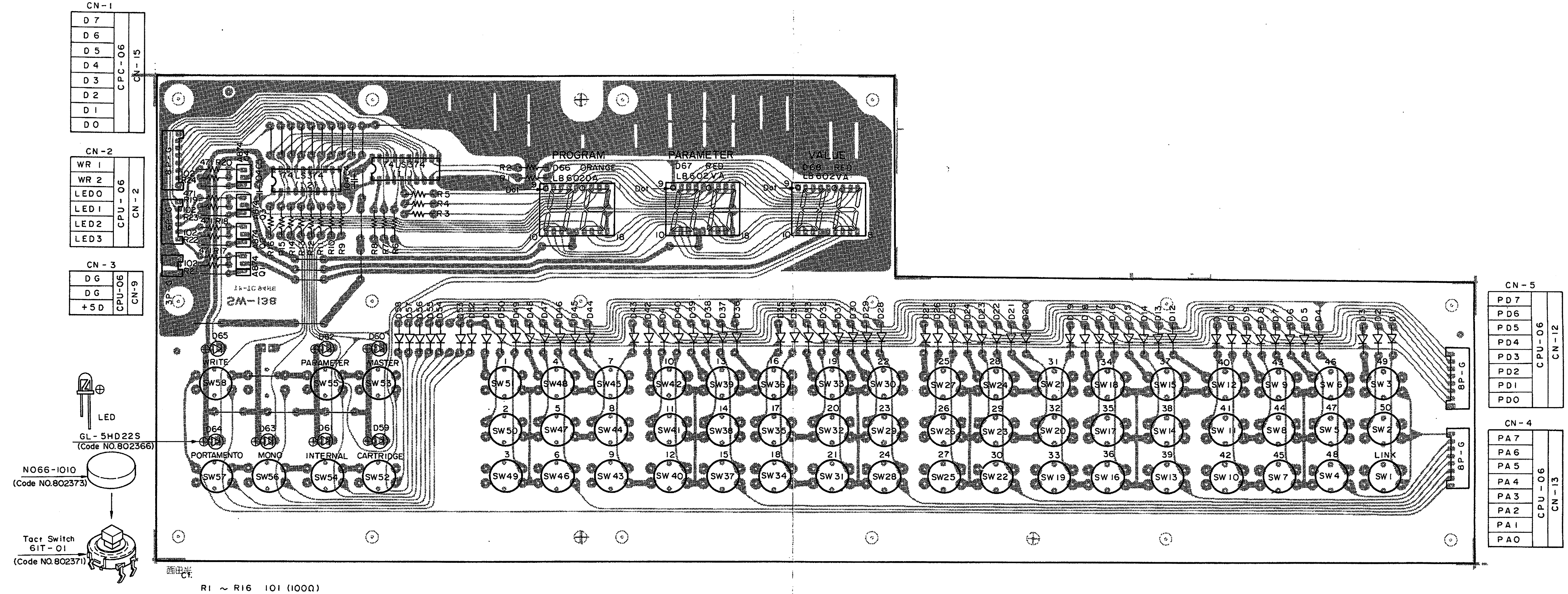
Cf.
CP5; Battery Current Low
CP6; Battery Current High
CP7; Battery Voltage
CP8; Digital Ground

REMOVE ROM ✓ PIN 19 FOR NOISE -

NO CART ACCESS

JS 4/8

SW-138 TERMINALS INFORMATION



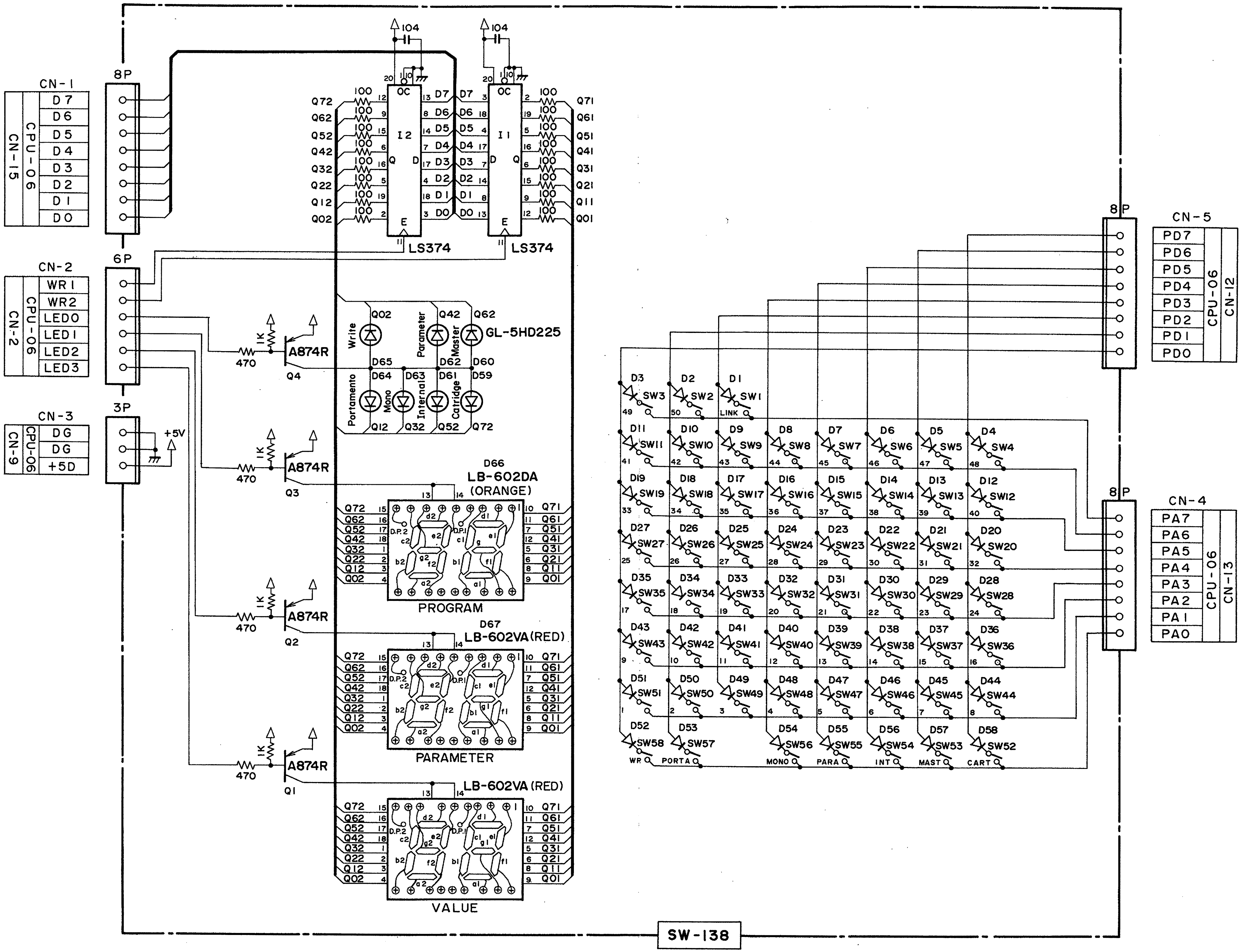
R1 ~ R16 101 (100Ω)

D1 ~ D58 1S2473

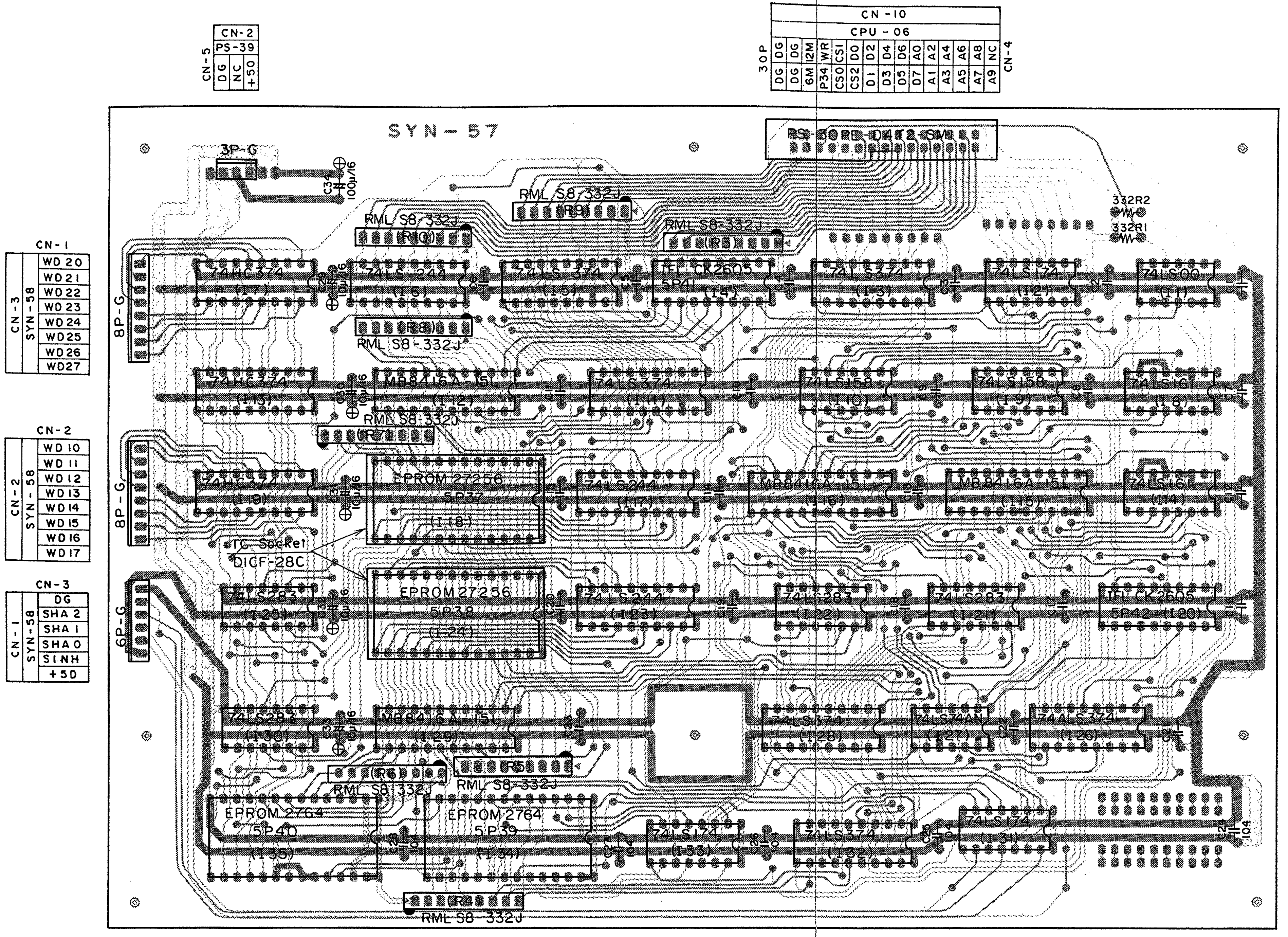
C1 ~ C3 Ceramic Capacitor 103

D59 ~ D65 LED GL-5HD22S

SW-138 CIRCUIT DIAGRAM

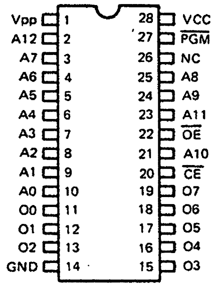


SYN-57 TERMINALS INFORMATION



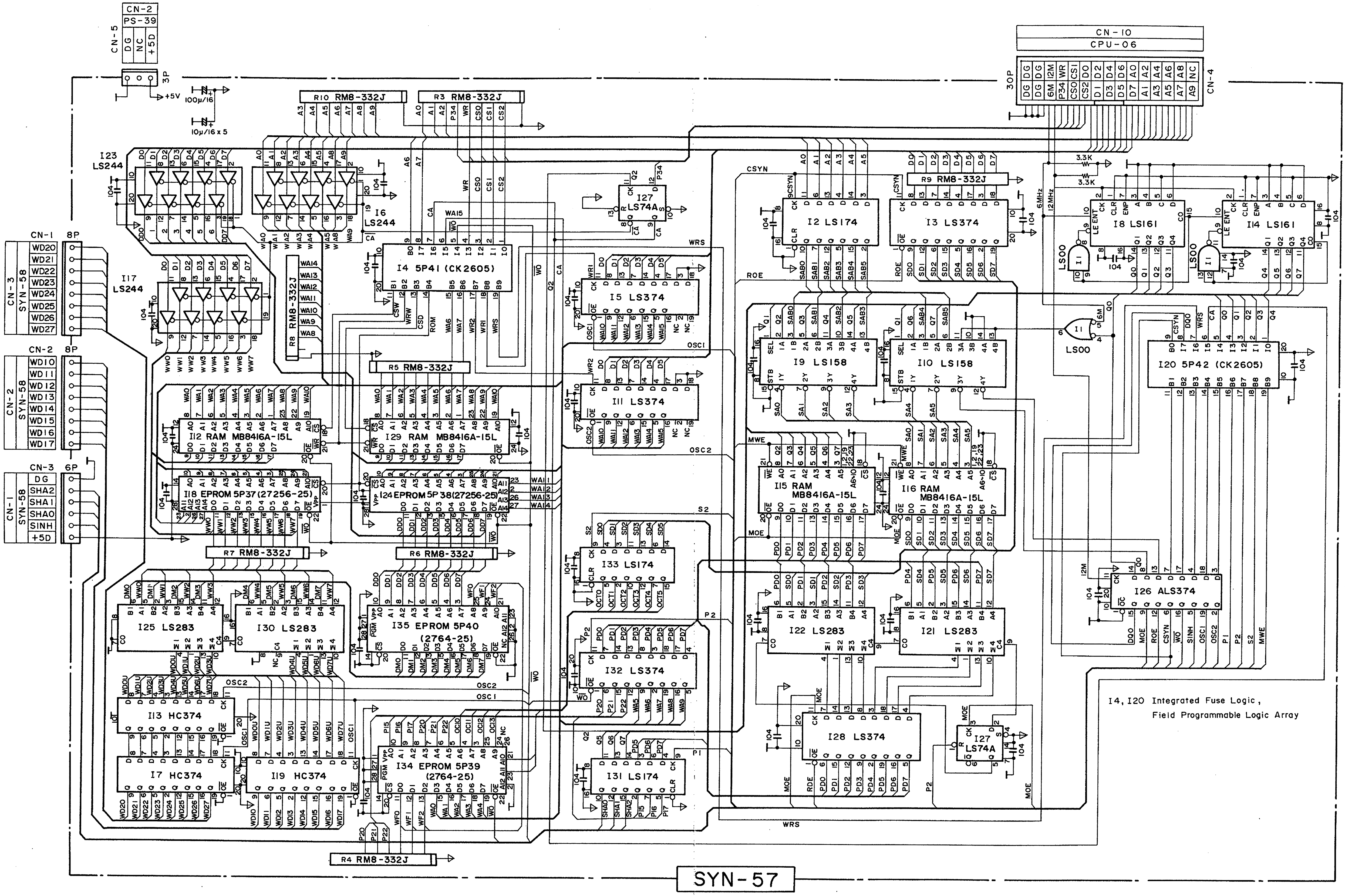
Cf. C1 ~ C23 Ceramic Capacitor 104
C25 ~ C28 Monolithic Ceramic Capacitor 104

2764
8192-WORD x 8-BIT UV ERASABLE AND PROGRAMMABLE READ ONLY MEMORY

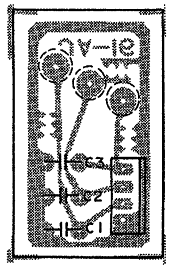


(TOP VIEW)

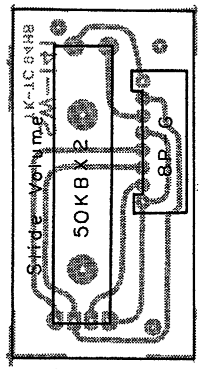
SYN-57 CIRCUIT DIAGRAM



SYN-58, SW-141, JA-16 TERMINALS INFORMATION



HPL	SYN-58	CN-7
DG		
HPR		
FRAME GROUND		



VR3R	SYN-58	CN-8
AG		
VR3L		
AG		
VR2R		
AG		
VR2L		
AG		

Cf. 1. D1 ~ D24 1SS133

2. R271 ~ 274 Metal Graze Variable Resistor

3. © Ceramic Capacitor

CN-7

HPR	JA-16	HEAD-PHONE
DG		
HPL		

CN-8

SW-141							
VOLUME							
AG	VR2L	AG	VR2R		VR3L		VR3R

CN-6

CN-2		CN-1			
PS-39		JA-15			
+5	DG	AG	OUTL	AG	OUTR

CN-5

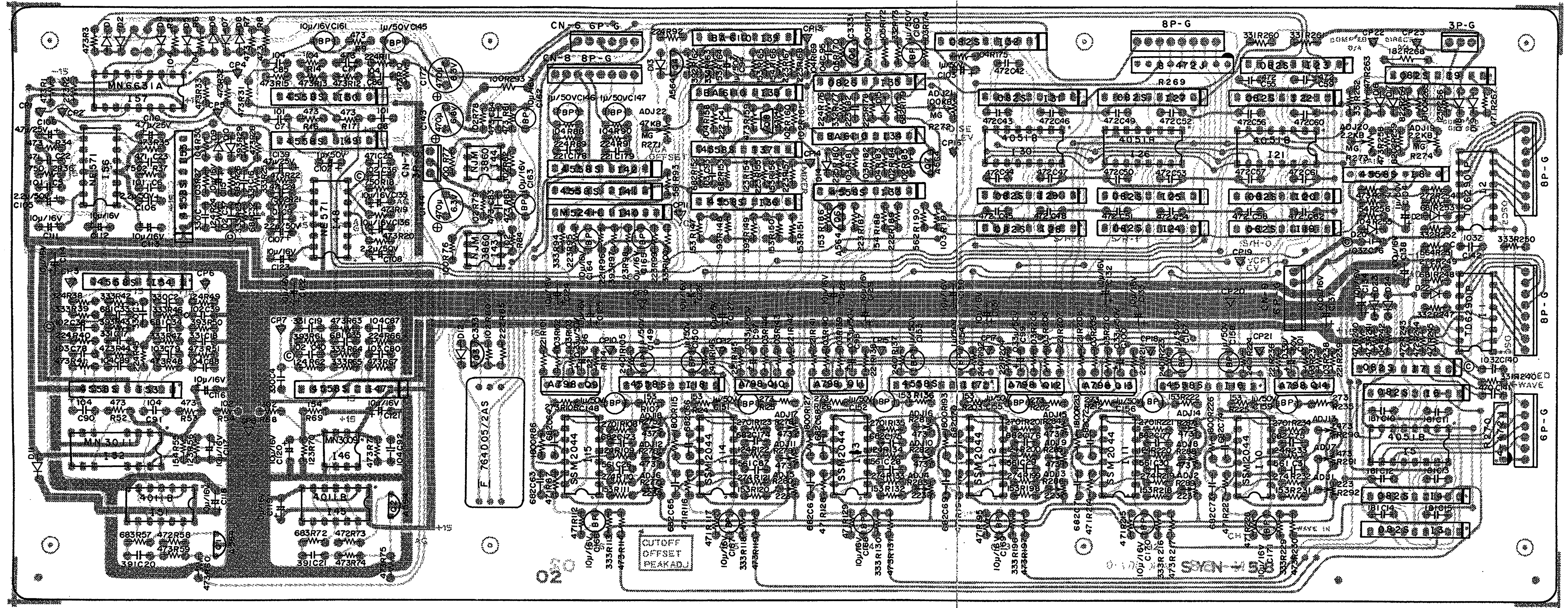
CN-4							
CPU-06							
RELY		INH2	INH1	INH0	SELC	SELB	SELA

CN-9

+5	PS-39	CN-2
AG		CN-1
-15		
AG		
AG	JA-15	CN-1
+15	PS-39	CN-1

CN-4

CN-5		
CPU-60		
	ANLG	



CN-3

WD20	SYN-57	CN-1
WD21		
WD22		
WD23		
WD24		
WD25		
WD26		
WD27		

CN-2

WD10	SYN-57	CN-2
WD11		
WD12		
WD13		
WD14		
WD15		
WD16		
WD17		

CN-1

DG	SYN-57	CN-3
SHA2		
SHA1		
SHA0		
SINH		
+5		

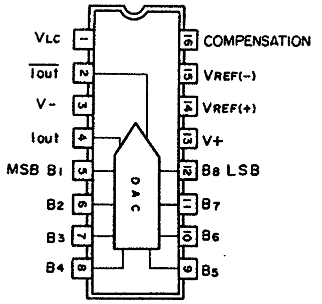
I57 MN6631A CHORUS EFFECT FUNCTION

L → SW ON L ≈ 0V H ≈ 5V

MODE \ I57	S_1 17 pin	S_2 9 pin	S_3 1 pin	S_4 8 pin	S5 11 pin	I31 CHORUS LFO
0	H	H	L	H	H	Direct Signal
1	L	H	L	L	H	0.7Hz Triangle Wave
2	L	H	L	L	H	1.4Hz Triangle Wave
3	L	H	L	L	H	0.7Hz + 1.4Hz Triangle Wave
4	L	H	L	L	H	7Hz Triangle Wave
5	L	H	L	L	H	CV=5V LCH→ Direct +3.9ms Delay RCH→ Direct +1.9ms Delay
6	L	H	L	L	H	CV=0V LCH→ Direct +1.2ms Delay RCH→ Direct +6.5ms Delay
7	H	H	H	H	L	CV=0V LCH→ Direct RCH→ 53ms Delay

TD62901P

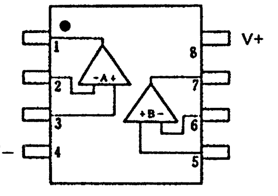
Multiplying type Monolithic 8-bit High-speed Current-Output Digital-to-Analog Converter



RC-4558DN (Code No. 706016)
TL-082CP (Code No. 706069)
OPERATIONAL AMPLIFIER

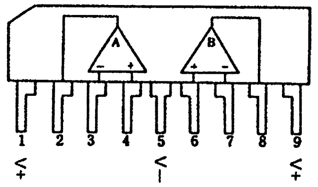
D, M Type

(TOP VIEW)

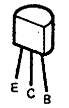


RC-4558S (Code No. 800744)
TL-082S (Code No. 800743)

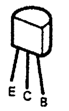
S Type



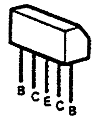
2SA564 (Code No. 706102)



2SC331 (Code No. 801798)

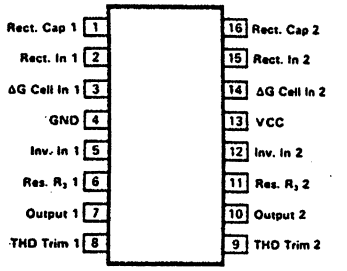


2SA798 (Code No. 706124)

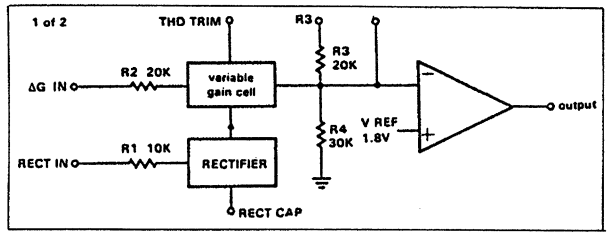


NE571 (Code No. 800062)

COMPANDOR

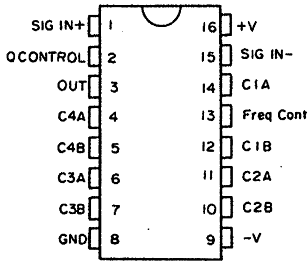


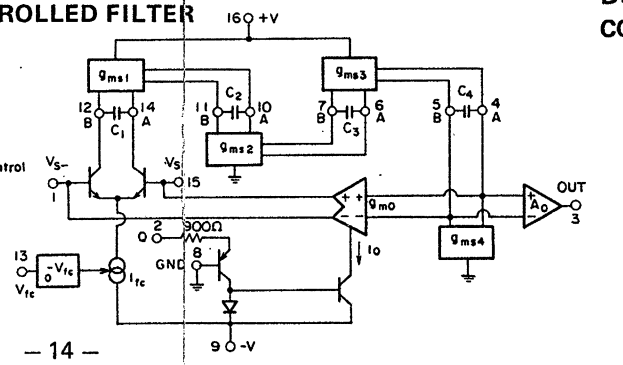
BLOCK DIAGRAM



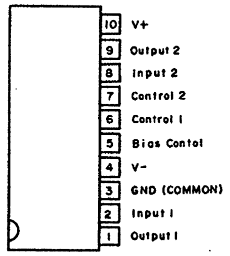
SSM 2044 (Code No. 800056)

4-POLE VOLTAGE CONTROLLED FILTER

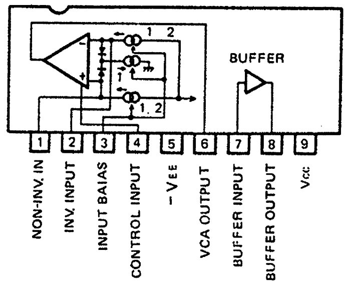




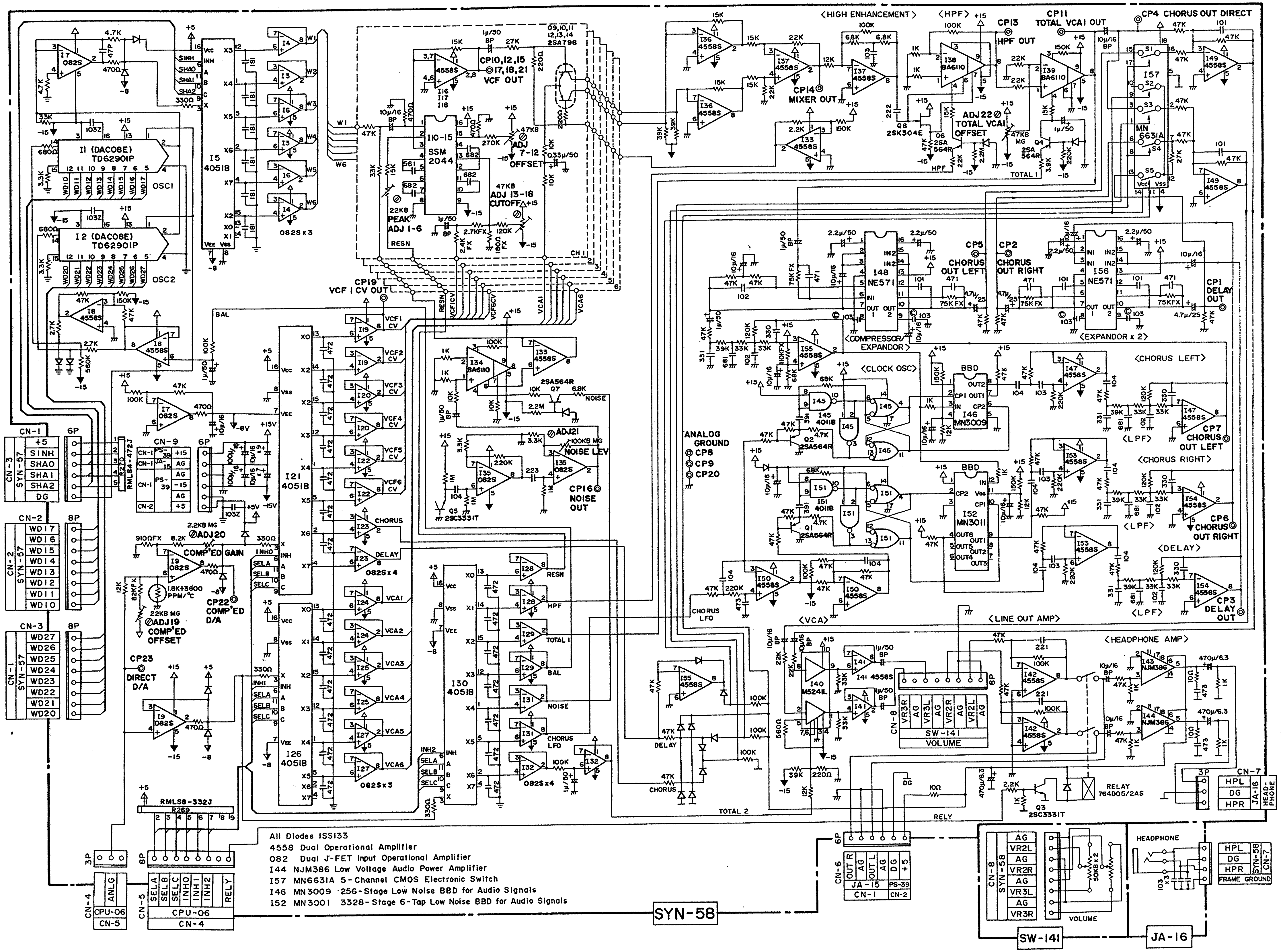
M5241L (Code No. 802358)
DUAL VOLTAGE CONTROLLED AMPLIFIER



BA6110 (Code No. 706937)
VOLTAGE CONTROLLED OPERATIONAL AMPLIFIER

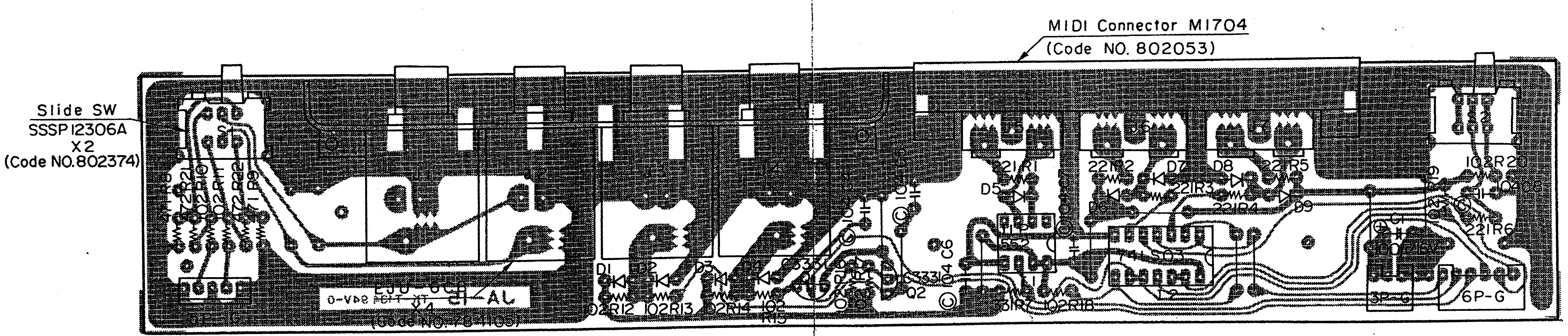


SYN-58, SW-141, JA-16 CIRCUIT DIAGRAM



All Diodes ISS133
4558 Dual Operational Amplifier
082 Dual J-FET Input Operational Amplifier
I44 NJM386 Low Voltage Audio Power Amplifier
I57 MN6631A 5-Channel CMOS Electronic Switch
I46 MN3009 256-Stage Low Noise BBD for Audio Signals
I52 MN3001 3328-Stage 6-Tap Low Noise BBD for Audio Signals

JA-15 TERMINALS INFORMATION



Slide SW
SSSP12306A
X2
(Code NO.802374)

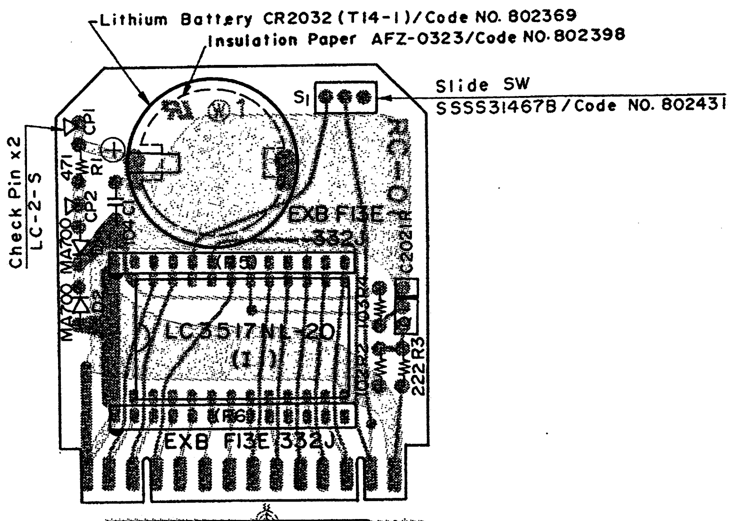
MIDI Connector M1704
(Code NO. 802053)

CN-1	GND	L/MONO	SG	R	SG
	SYN-58				
	CN-9	CN-6			

CN-2	+5D	NC	DG
	PS-39		
	CN-2		

CN-3	RELY	RELS	PRGU	MDIN	MDOT	PRTC
	CPU-06					
	CN-3					

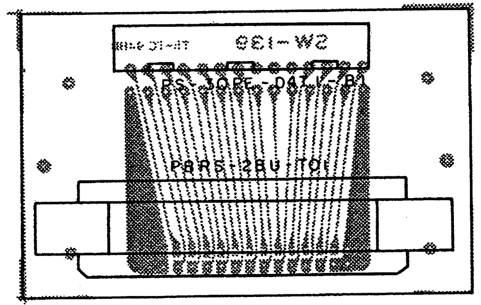
RC-01, SW-139 TERMINALS INFORMATION



Lithium Battery CR2032 (T14-1)/Code NO. 802369
Insulation Paper AFZ-0323/Code NO. 802398
Slide SW
SSSS31467B/Code NO. 802431
Check Pin x2
LC-2-S

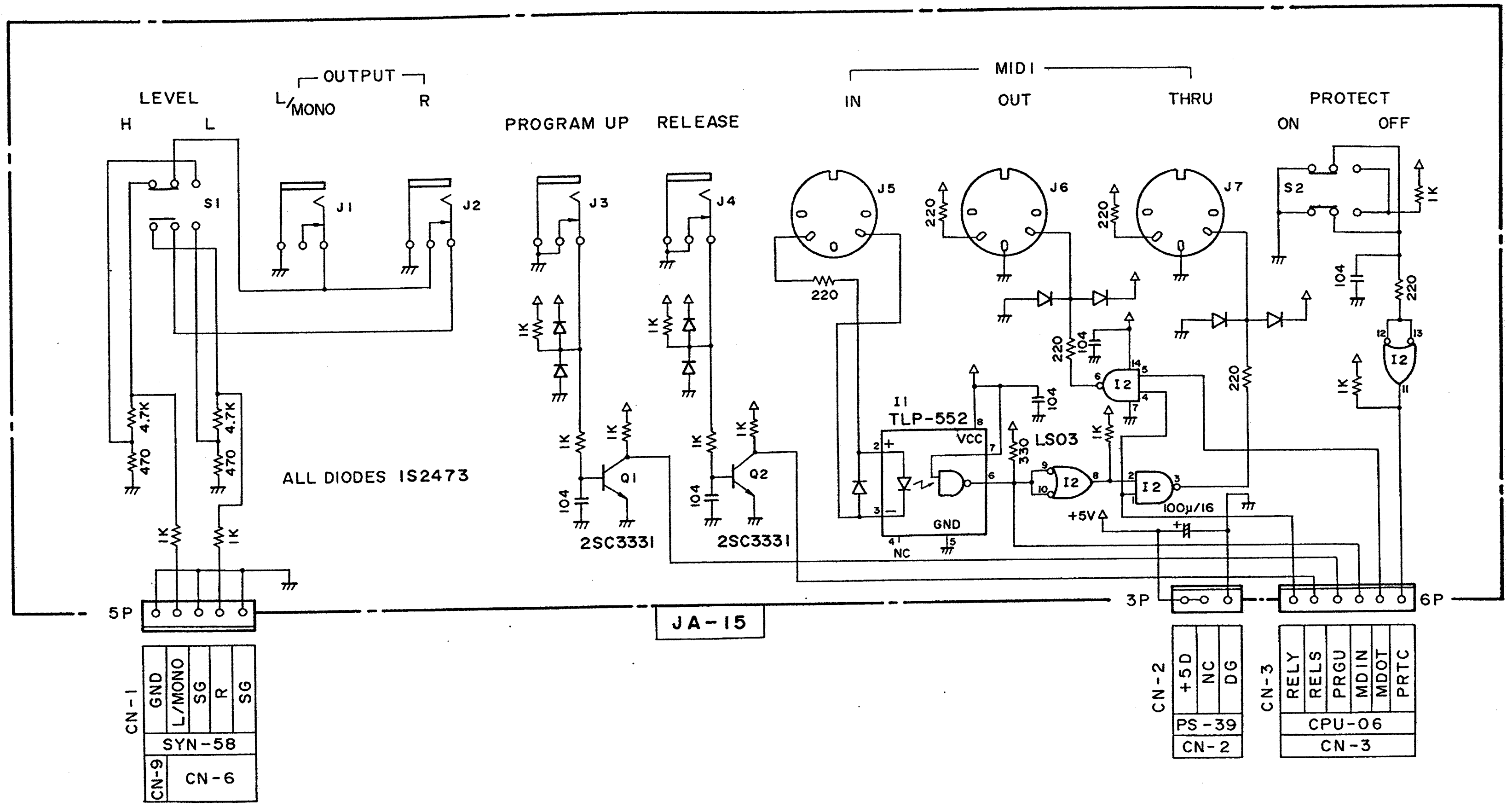
+5D	A7	A6	A5	A4	A3	A2	A1	A0	D0	D1	D2	WE	DG
ME	A8	A9	A10	NC	NC	NC	D7	D6	D5	D4	D3	OE	CE
SW-139													
CN-2													

CN-14														
CPU-06														
+5D	+5D	A7	A6	A5	A4	A2	A1	A0	D0	D1	D2	WE	DG	DG
+5D	ME	A8	A9	A10	A3	D7	D6	D5	D4	D3	OE	CE	DG	DG

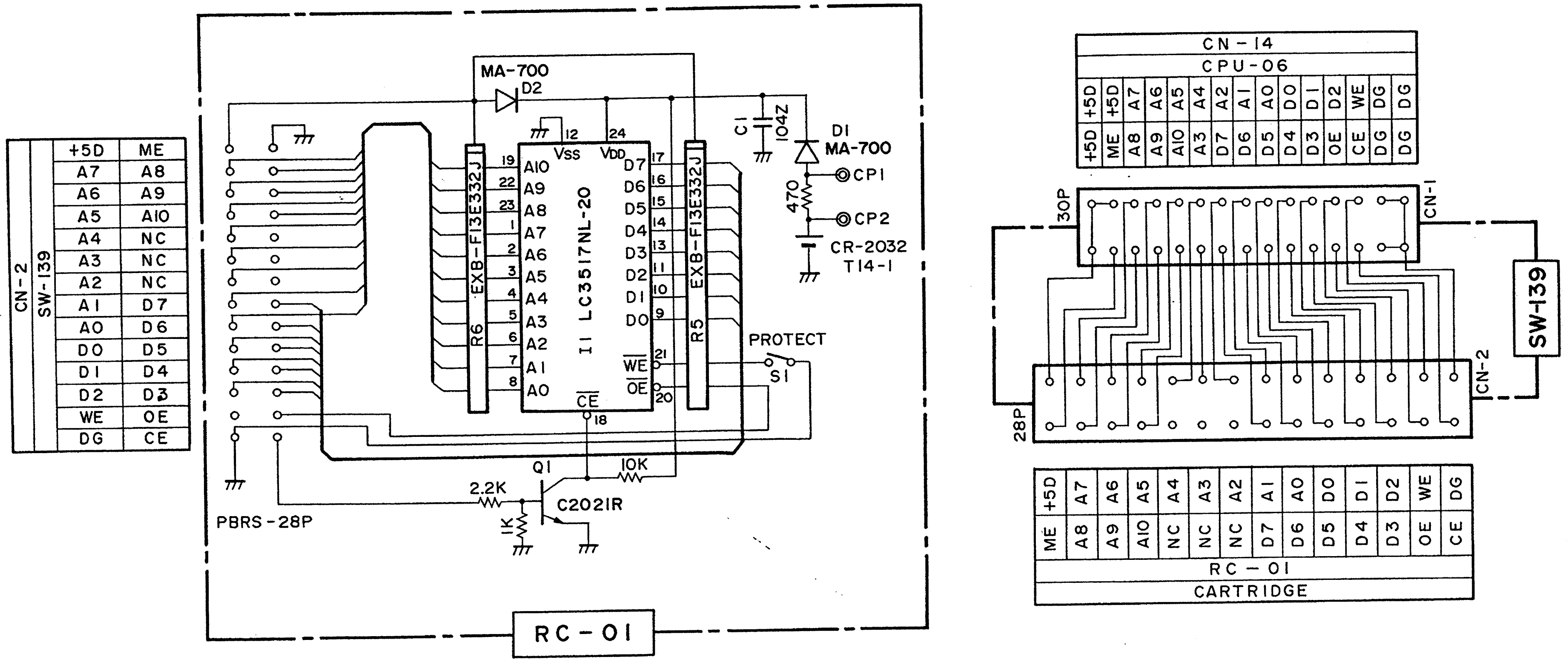


+5D	A7	A6	A5	A4	A3	A2	A1	A0	D0	D1	D2	WE	DG
ME	A8	A9	A10	NC	NC	NC	D7	D6	D5	D4	D3	OE	CE
RC-01													
CARTRIDGE													

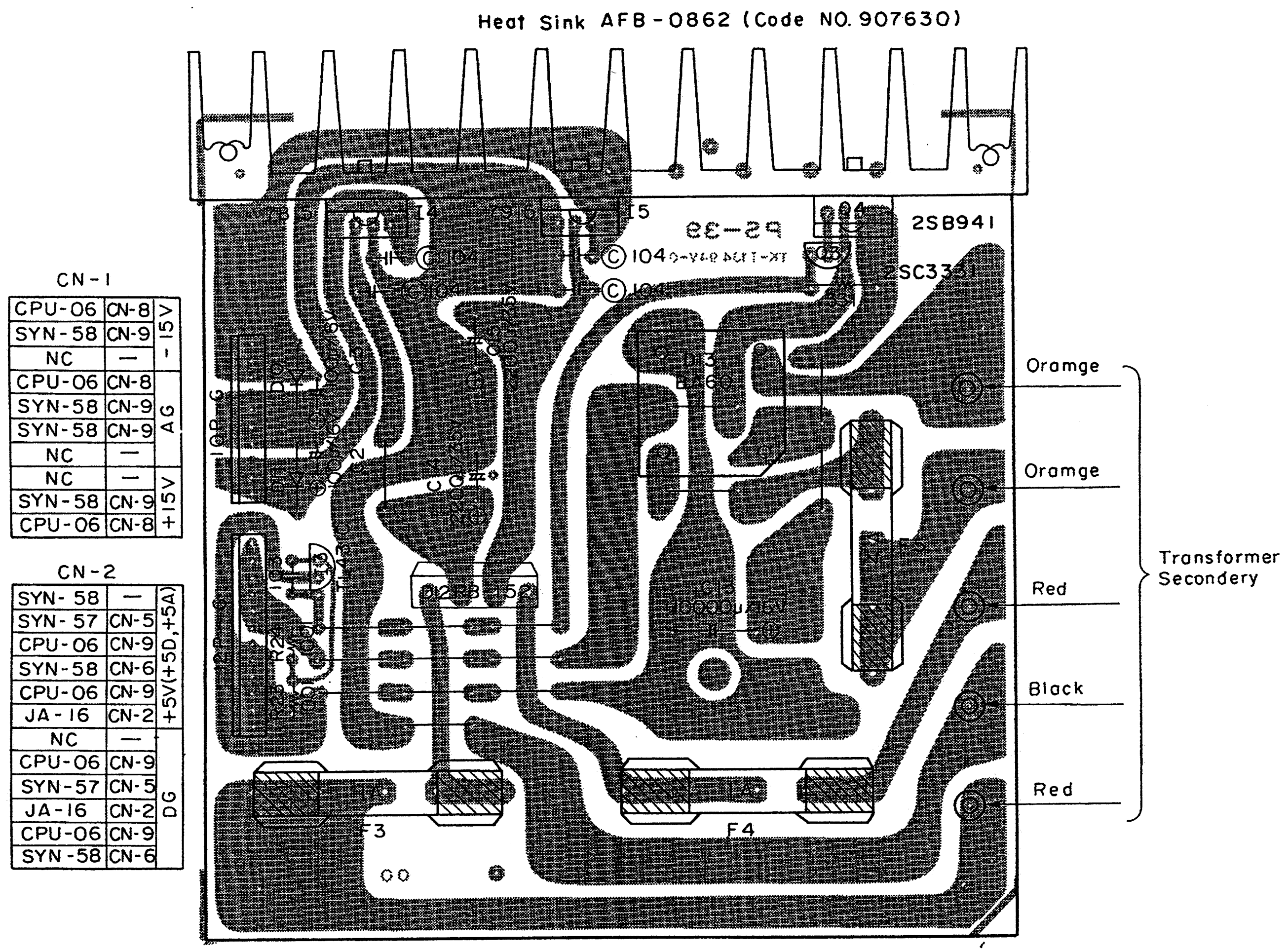
JA-15 CIRCUIT DIAGRAM



RC-01, SW-139 CIRCUIT DIAGRAM



PS-39, FH-10 TERMINALS INFORMATION



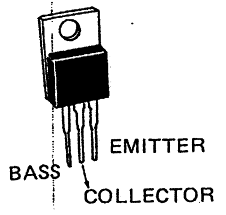
CN-1

CPU-06	CN-8	-15V
SYN-58	CN-9	
NC	—	
CPU-06	CN-8	AG
SYN-58	CN-9	
SYN-58	CN-9	
NC	—	
NC	—	+15V
SYN-58	CN-9	
CPU-06	CN-8	

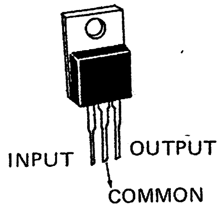
CN-2

SYN-58	—	+5V(+5D,+5A)
SYN-57	CN-5	
CPU-06	CN-9	
SYN-58	CN-6	
CPU-06	CN-9	
JA-16	CN-2	
NC	—	DG
CPU-06	CN-9	
SYN-57	CN-5	
JA-16	CN-2	
CPU-06	CN-9	
SYN-58	CN-6	

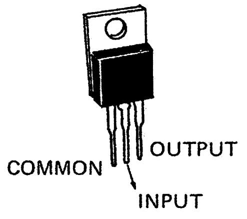
2SB941Q (Code No. 800064)
Si PNP Epitaxial Planar



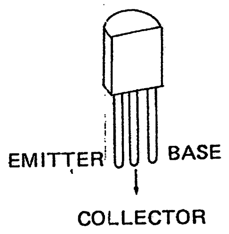
7815 (Code No. 706097)
POSITIVE-VOLTAGE REGULATORS



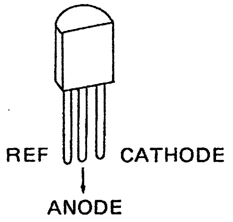
7915 (Code No. 706098)
NEGATIVE-VOLTAGE REGULATORS

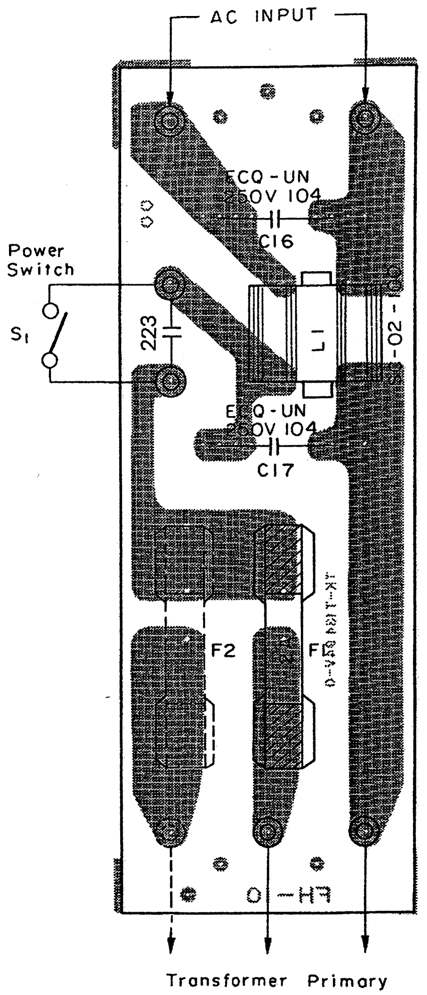


2SC3331 (Code No. 801798)
Si NPN Epitaxial Planar



TL431C (Code No. 800063)
ADJUSTABLE PRECISION SHUNT REGULATORS





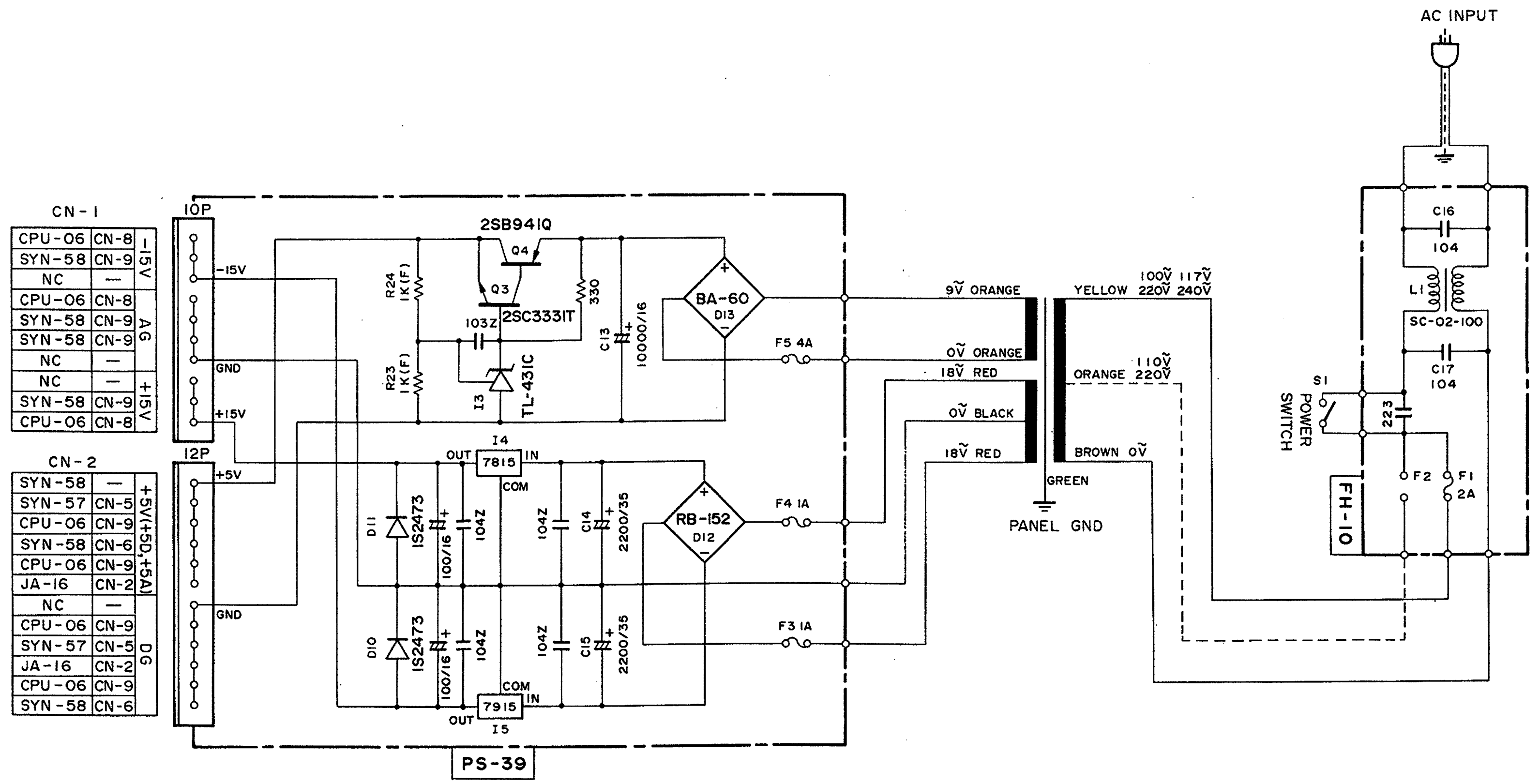
POWER SUPPLY INFORMATION AND PARTS LIST

	POWER CABLE		TRANSFORMER		FUSE							
	TYPE	CODE NO.	TYPE	CODE NO.	F1	CODE NO.	F2	CODE NO.	F3, 4	CODE NO.	F5	CODE NO.
U.S.A. CANADA	UL-CSA SJT	789349	TSE-239-U	802346	2A	713422			1A	713587	4A	713586
AUSTRALIA	SAA CLASS-2	789346	TSE-239-I	802345	1A	713344	(1A)	713344	1A	713344	4A	713585
GREAT BRITAIN	BS CLASS-2	789347										
EUROPE	CEE CLASS-2	789345										
OTHERS	SPT-2	789332	TSE-239-E	802344	2A	713350	(2A)	713350	1A	713349	4A	713357
JAPAN		802017	TSE-239-D	802343	2A	713350			1A	713349	4A	713357

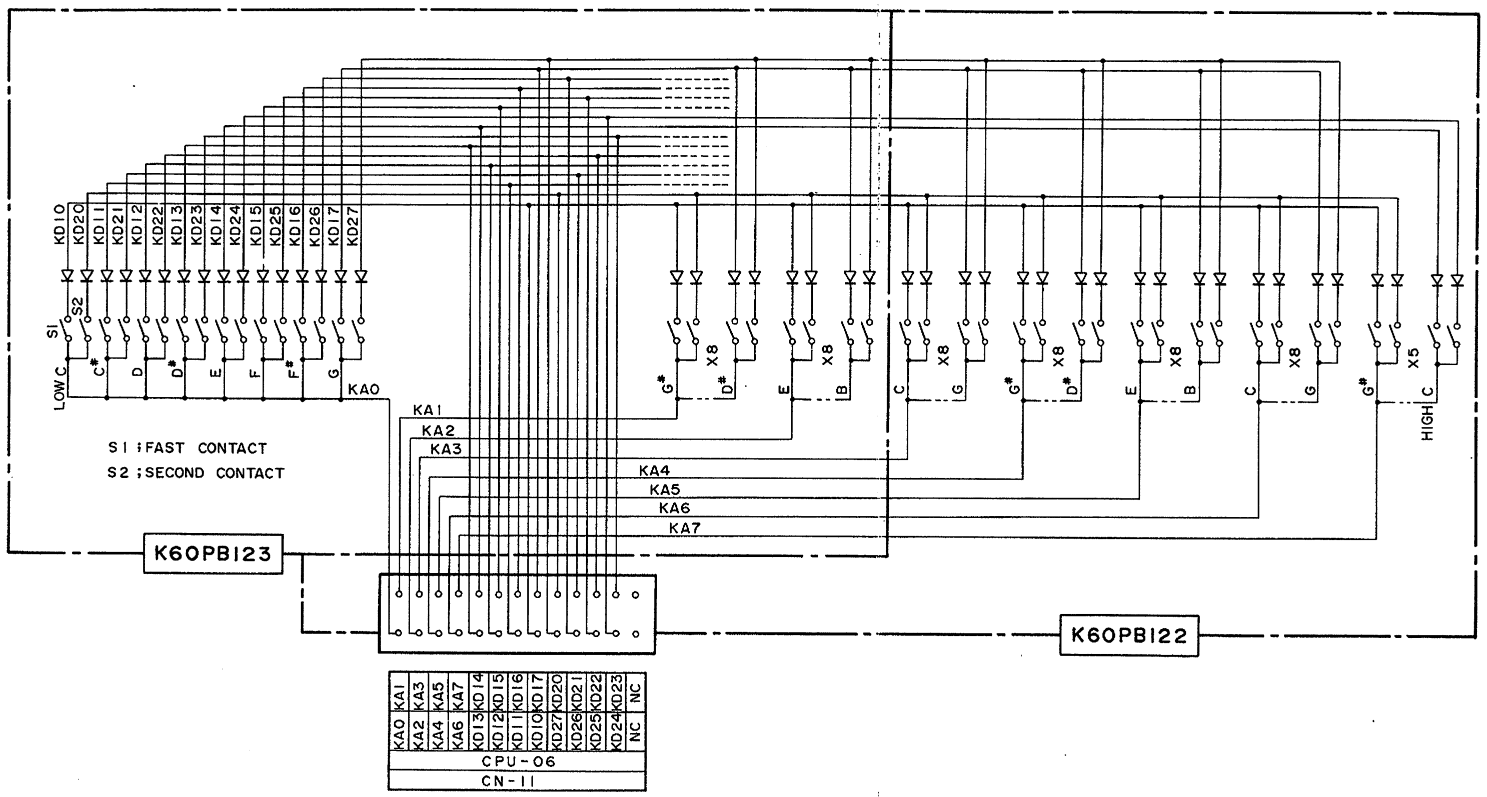
POWER SUPPLY PARTS LIST PS-39, FH-10

NAME	PART NO.	TYPE	CODE NO.
POWER SWITCH	S1	SDDJA1	802413
IC	I4	μPC7815	706097
	I2	μPC7915	706098
	I3	TL431	800063
TRANSISTOR	Q4	2SB941Q	800064
	Q3	2SC3331	801798
DIODE	D12	RB-152	706319
	D13	DBA-60C-K15	706548
	D10, D11	1S2473	706317
COIL	L1	SC-02-100	800058
C (JAPAN, Others) CAPACITOR	C16, C17	ECQ-E-1000V104M	800711
	C16, C17	ECQ-UN250V104	802342
	C13	10000μF16V	801556
	C14, C15	2200μF35V	802421
RESISTOR	R23, R24	CRB20FX1001	800766

PS-39, FH-10 CIRCUIT DIAGRAM



KEYBOARD CIRCUIT DIAGRAM



PARTS LIST

RC-01

NAME	PART NO.	TYPE	CODE NO.
IC	I1	LC3517NL-20	802356
TRANSISTOR	Q1	2SC2021R	802363
DIODE	D1	MA-700	802364
RESISTOR	R5, R6	EXB-F13E332J	802377
BATTERY		CR2032(T14-1)	802369
CAPACITOR	C1	50V104Z	800663
CONNECTOR		PBRS-28P	802347
SLIDE SW.	S1	SSSS31467B	802431

SW-139

NAME	PART NO.	TYPE	CODE NO.
CONNECTOR	CN-2	PBRS-28U-T01	802348
	CN-1	PS-30PE-D4T1-B1	802351

JA-15

NAME	PART NO.	TYPE	CODE NO.
IC	I2	SN74LS03N	706951
	I1	TLP552	802361
TRANSISTOR	Q1, Q2	2SC3331	801798
DIODE		1S2473	706317
SHORT JACK	J1, J2, J3, J4	EJU6C8	784105
MIDI CONNECTOR	J5, J6, J7	M1704	802053
SLIDE SWITCH	S1, S2	SSSP12306A	802374

SW-138

NAME	PART NO.	TYPE	CODE NO.
IC	I1, I2	74LS374	800714
TRANSISTOR	Q1, Q2, Q3, Q4	2SA874R	802362
DIODE	D1 ~ 58	1S2473	706317
LED	D59 ~ 65	GL-5HD22S	802366
NUMERAL LED	D66	LB602DA2	802367
	D67, D68	LB602VA2	802368
TACT SW.	SW1 ~ 58	61T-01	802371
KEYTOP		N066-1010	802372

SYN-57

NAME	PART NO.	TYPE	CODE NO.
16KEPROM	I18	5P37/EPROM 27256	907505
(for Japan)	I24	5P38/EPROM 27256	907510
8KEPROM	I34	5P39/EPROM 2764	907515
	I35	5P40/EPROM 2764	907520
IFL	I4	5P41	907525
	I20	5P42	907530
2K RAM	I12, 15, 16, 29	MB8416A-15L-SK	802043
IC	I1	74LS00	800720
	I27	74LS74AN	706927
	I9, I10	74LS158	802409
	I8, I14	74LS161	800756
	I2, I31, I33	74LS174	707008
	I6, I17, I23	74LS244	800675
	I21, 22, 25, 30	74LS283	802352
	I3, 5, 11, 28, 32	74LS374	800714
	I7, I13, I19	TC74HC374	801928
	I26	74ALS374	802353
RESISTOR	R3, 4, 5, 6, 7, 8, 9, 10	RMLS8-332J	800044
IC SOCKET	I18, I24	DICF-28C	800224
CONNECTOR	CN-4	PS-30PE-D4T2-SM1	802350

CPU-06

NAME	PART NO.	TYPE	CODE NO.
IC/TTL	I12	74LS02	800721
	I15, I23, I28	74LS04	706957
	I21	74LS21	802236
	I22	74LS32N	706914
	I2, I24	74LS74AN	706927
	I13, I14, I20, I31	74LS138	706939
	I17	74LS139	800807
	I19	74LS174	707008
	I18	74LS175	800719
	I35	74LS244	800675
	I34	74LS245N	706948
	I26, I27, I32, I33	74LS365	800793
	I5	74LS373N	706929
IC/HCMOS	I25	74HC02	802354
	I1, I16	74HC04	802355
	I29, I30	74HC153	802046
	I37	74HC174	802239
	I36	74HC374	801928
CPU	I4	P8031	800046
GATE ARRAY	I9	MB63H158	802042
2K RAM	I7, I8	LC3517NL-20	802356
2K RAM	I10, I11	MB8416A-15L-SK	802043
32K EPROM	I6	5P36/EPROM27256	907500
LINEAR IC	I41	RC-4558DN	706016
	I38	TL082CP	706069
	I3	TL7705CP-B	800666
	I39, I40	LM311P	800050
TRANSISTOR	Q1	2SA564R	706102
	Q2	2SC3331	801798
Schottky Barrier Diode	D1, D3	MA-700	802364
ZENER DIODE	D2	HZ3BLL	802365
RESISTOR	ADJ1	H1021A220KB	802422
	ADJ2	H1021A100KB	710147
	R46, R47	RMLS8-103J	802050
	R45	RN3QEL472Z	802430
	R43, R44	CRB20FX1001	800766
CRYSTAL	X1	HC18/U 12.000MHZ	800053
CONNECTOR	CN-11	PS-26PE-D4T2-SM1	802349
	CN-10, CN-14	PS-30PE-D4T2-SM1	802350
BATTERY	B	CR2032(T14-1)	802369

SW-140

NAME	PART NO.	TYPE	CODE NO.
PULSE SWITCH	SW1	SGFV01T	800036
BENDER VOLUME	VR1	RK1631110	802375

SYN-58

NAME	PART NO.	TYPE	CODE NO.
BBD	I46	MN3009	706071
	I52	MN3011	802359
VCA	I34, 38, 39	BA6110	706937
VCF	I10, 11, 12, 13, 14, 15	SSMT2044	800056
LINEAR IC	I43, I44	NJM-386D	707005
	I48, I56	NE571	800062
	I40	M5241L	802358
	I3, 4, 6, 7, 9, 19, 20, 22, 23, 24, 25, 27, 28, 29, 31, 32, 35	TL-082S	800743
	I8, 16, 17, 18, 33, 36, 37, 41, 42, 47, 49, 50, 53, 54, 55	RC-4558S	800744
IC	I45, 51	MB84011B	706982
	I5, 21, 26, 30	MB84051B	706984
	I57	MN6631A	802360
	I1, I2	TD62901P	802357
TRANSISTOR	Q9, 10, 11, 12, 13, 14	2SA798F	706124
	Q1, 2, 3, 4, 6, 7	2SA564R	706102
	Q3, Q5	2SC3331	801798
FET	Q8	2SK-304E	706537
DIODE		1SS133	800625
RESISTOR		1.8K+3600PPM/°C	710013
		CRB20FX1800Ω	800745
		CRB20FX2401	802379
		CRB20FX2701	802380
		CRB20FX7502	802381
		CRB20FX1103	802382
		CRB20FX9100	802404
		CRB20FX8202	802405
		RMLS4-472J	710014
		RMLS8-472J	710015
VR	ADJ20	H1021A 2.2KB	710151
	ADJ19	H1021A 22KB	710152
	ADJ22	H1021A 47KB	710145
	ADJ21	H1021A 100KB	710147
	ADJ1, 2, 3, 4, 5, 6	22KBH0651A015	800029
	ADJ13, 14, 15, 16, 17, 18	47KBH0651A017	800030
REED RELAY		764D05/2AS	802370

SW-141

NAME	PART NO.	TYPE	CODE NO.
SLIDE VOLUME		S3028PC02M-50KB2	800706

JA-16

NAME	PART NO.	TYPE	CODE NO.
HEADPHONE JACK		HLJ0606-01-020	802376

TEST TONE CHART

TEST TONE NO. PROGRAM			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DESCRIPTION			BASIC WORK	OFFSET ADJUST	PEAK ADJUST	CUTOFF ADJUST	COMPED. GAIN	VCF OFFSET	OSC1	OSC2	BALONCE (1)	BALANCE (2)	PITCH BEND	VCF-KCV	VCF-ENV (1)	VCF-ENN (2)	LOW CUT	VCA LEVEL	LFO-VCF	LFO-VCA	VELO-VCF	VELO-VCA	PRES-VCF	CHORUS	LEVEL MAX (1)	LEVEL MAX (2)
No.	PARAMETER																									
1	OSC1	WAVE	1	0	0	0	0	1	㉜	0	0	1	1	0	0	0	32	1	0	1	0	1	0	1	0	0
2		RANGE	8	8	8	8	8	8	4	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3		PORTA. SP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4		BALANCE	0	0	0	0	0	0	-15	15	(-15)	(+15)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5		PITCH BEND	1	1	1	1	1	1	1	0	1	1	⑦	1	1	1	1	1	1	1	1	1	1	1	1	1
6		AUTO BEND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	OSC2	WAVE	1	0	0	0	0	1	0	㉜	1	0	0	0	0	0	32	1	1	1	0	1	0	1	0	0
8		COARSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9		FINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	VCF	CUTOFF	(99)	60	60	(60)	(99)	99	99	99	99	99	99	㊿	30	50	99	99	60	99	60	99	40	99	50	50
11		RESONANCE	0	⓪	㉚	31	31	0	0	0	0	0	0	31	31	31	0	0	31	0	31	0	31	0	31	31
12		LOW CUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	㉛	0	0	0	0	0	0	0	0	0
13		ENV	0	0	0	0	0	0	0	0	0	0	0	0	㉛	㉛	0	0	0	0	0	0	0	0	0	0
14		ATTACK	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0
15		DECAY	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0
16																										
17		SUSTAIN	31	31	31	31	31	31	31	31	31	31	31	31	0	0	31	31	31	31	31	31	31	31	31	31
18		RELEASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	VCA	LEVEL	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	㉛	31	31	31	31	31	31	㉛	㉛
20		ATTACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21		DECAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22																										
23		SUSTAIN	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
24		RELEASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	LFO	SHAPE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26		SPEED	50	50	50	50	50	99	50	50	50	50	50	50	50	50	50	50	80	99	50	50	50	50	50	50
27		DELAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28		OSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29		VCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	⑧	0	0	0	0	0	0	0
30		VCA	0	0	0	0	0	㉛	0	0	0	0	0	0	0	0	0	0	0	㉛	0	0	0	0	0	0
31	TOUCH VELO VCF		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	⑮	0	0	0	0	0
32		VELO VCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	⑮	0	0	15	15
33		PRES OSC BAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34		PRES VCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	⑮	0	0	0
35		PRES VCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15
36		PRES LFO OSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	KCV	VCF	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	14	14
38		VCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	-15
39	CHORUS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	⑦	0	0
	PORTAMENTO		ALL OFF																							
	MONO		ALL OFF																							

CREATION OF MEMORY CARTRIDGE FOR ADJUSTMENT

Use each test tone for adjustment and check.

Write suitable test tones into the memory cartridge according to the Test Tone Chart as follows:

1. Insert a cartridge in which to store test tones and set the PROTECT switch to OFF.
2. Set the PWR switch to ON.
3. Set the INTERNAL switch to ON and the INTERNAL PROTECT switch to OFF.
4. Set the PARAMETER switch to ON then input each parameter value according to the Test Tone Chart.
5. Write all parameters of a single program, display each parameter marked with a circle in the Test Tone Chart, set the WRITE switch to ON, and set a test tone program number. Thus, writing data into the internal memory is completed.
6. Repeat step 5 the number of times equal to all test tones stored into the internal memory successfully.
7. Set the MASTER and SAVE switches to ON to save the internal data into the memory cartridge.

Thus, a test tone program cartridge has been created. This cartridge is used for adjustment and inspection.

K3 ADJUSTMENT INSTRUCTIONS

Measuring Instruments:

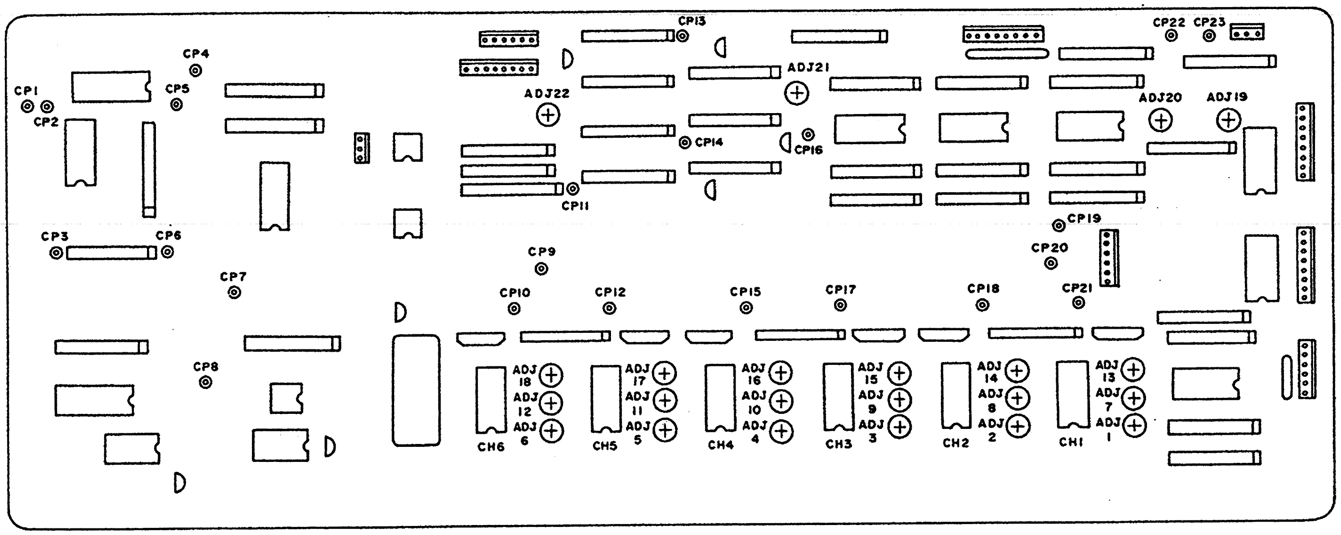
- o Digital voltmeter
- o Oscilloscope (dual-beam)
- o Frequency counter
- o VTVM
- o Weights (600g and 1500g)
- o Adjustable memory cartridge
- o Monitor amplifier and 8-ohm headphones

1. ROUGH PERFORMANCE CHECK (TEST-TONE 1)

Connect the monitor amplifier to MONO-OUT with volume control VR at the full position, the LEVEL switch set to H, and the PROTECT switch set to OFF. Then, switch the power on and check the following items:

- o Sounds are made at proper musical intervals with all keys on the keyboard.
- o Proper indications are obtained in operating all switches on the panel.
- o Values correctly vary with increments.
- o Upper and lower semitones are properly made by rotating the bender wheel.
- o Sounds fade when volume control VR is minimized.

SYN-58 Checking Points and Adjusting Points



CP1	Delay Out
CP2	Chorus Out Right
CP3	Delay Filter Out
CP4	Chorus Out Direct
CP5	Chorus Out Left
CP6	Chorus Filter Out Left
CP7	Chorus Filter Out Right
CP8	Analog Ground
CP9	Analog Ground
CP10	CH6 VCF Output
CP11	Total VCA1 Output
CP12	CH5 VCF Output
CP13	HPF Output

CP14	Mixer Output
CP15	CH4 VCF Output
CP16	Noise Output
CP17	CH3 VCF Output
CP18	CH2 VCF Output
CP19	VCF1 Control Voltage
CP20	Analog Ground
CP21	CH1 VCF Output
CP22	Temperature Compensated D/A
CP23	Direct D/A

ADJ1 ≀ ADJ6	CH1 Peak ≀ CH6 Peak
ADJ7 ≀ ADJ12	CH1 Offset Null ≀ CH6 Offset Null
ADJ13 ≀ ADJ18	CH1 Cutoff ≀ CH6 Cutoff
ADJ19	Temperature Compensated D/A Offset
ADJ20	Temperature Compensated D/A Gain
ADJ21	Noise Level
ADJ22	Total VCA1 Offset

2. ANALOG SOUND SOURCE SYSTEM ADJUSTMENT

- Make the following adjustments 5 or more minutes after power is switched on.
- Insert the adjustable memory cartridge and load timbres into the mainframe.

2-1 Noise Level Adjustment

- Connect GND probe of the VTVM to the AG terminal of the SYN-58 and the other probe to CP16 NOISE LEV.
- Adjust the ADJ21 NOISE LEV on the SYN-58 so that the meter reads -4 dBm irrespective of the timbres.

2-2 COMPÉD OFFSET Adjustment

- Set the timbre to TEST-TONE 2.
- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP19 VCF1CV.
- Adjust the ADJ19 COMPÉD OFFSET on the SYN-58 so that the reading on the screen is 0V ± 20 mVDC.

2-3 CHANNEL VCF OFFSET Adjustment (TEST-TONE 2)

- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ7 OFFSET 1 on the SYN-58 so that the reading on the screen is 0V ± 50 mVDC.
- Adjust the remaining five channels as follows:

  Adjust ADJ8 OFFSET2 on the SYN-58 with the other probe connected to CP18 VCF2.

  Adjust ADJ9 OFFSET 3 with the other probe connected to CP17 VCF3.

  Adjust ADJ10 OFFSET4 with the other probe connected to CP15 VCF4.

  Adjust ADJ11 OFFSET5 with the other probe connected to CP12 VCF5.

  Adjust ADJ12 OFFSET6 with the other probe connected to CP10 VCF6.

2-4 Channel VCF Peak Adjustment

- Set the timbre to TEST-TONE 3.
- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ1 PEAK1 on the SYN-58 to the threshold of oscillation, with the voltage range of the oscilloscope minimized.
- Adjust the remaining five channels as follows:

  Adjust ADJ2 PEAK2 on the SYN-58 with the other probe connected to CP18 VCF2.

  Adjust ADJ3 PEAK3 on the SYN-58 with the other probe connected to CP17 VCF3.

  Adjust ADJ4 PEAK4 on the SYN-58 with the other probe connected to CP15 VCF4.

  Adjust ADJ5 PEAK5 on the SYN-58 with the other probe connected to CP12 VCF5.

  Adjust ADJ6 PEAK6 on the SYN-58 with the other probe connected to CP10 VCF6.
- In the above state, check that no oscillation tones sound when six keys are pressed in arbitrary order.

2-5 Channel VCF1 Cutoff Adjustment

- Set the timbre to TEST-TONE 4.
- In this state, check that oscillation tones sound when six keys are pressed in arbitrary order.
- Connect the GND probe of the frequency counter to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ13 CUTOFF1 on the SYN-58 so that the frequency is 800 ± 2 Hz.

2-6 Channel VCF2-6 Cutoff Adjustment (TEST-TONE 4)

- Place the oscilloscope to the X-Y mode, then connect the GND probe to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Connect the other probe to CP18 VCF2 on the SYN-58.
- Draw Lissajou's figures on the screen and adjust ADJ14 CUTOFF2 on the SYN-58 so that the frequency difference is within 2 Hz.
- Adjust the remaining four channels as follows:

  Adjust ADJ15 CUTOFF3 with the other probe connected to CP17 VCF3 on the SYN-58.

  Adjust ADJ16 CUTOFF4 with the other probe connected to CP15 VCF4 on the SYN-58.

  Adjust ADJ17 CUTOFF5 with the other probe connected to CP12 VCF5 on the SYN-58.

  Adjust ADJ18 CUTOFF6 with the other probe connected to CP10 VCF6 on the SYN-58.

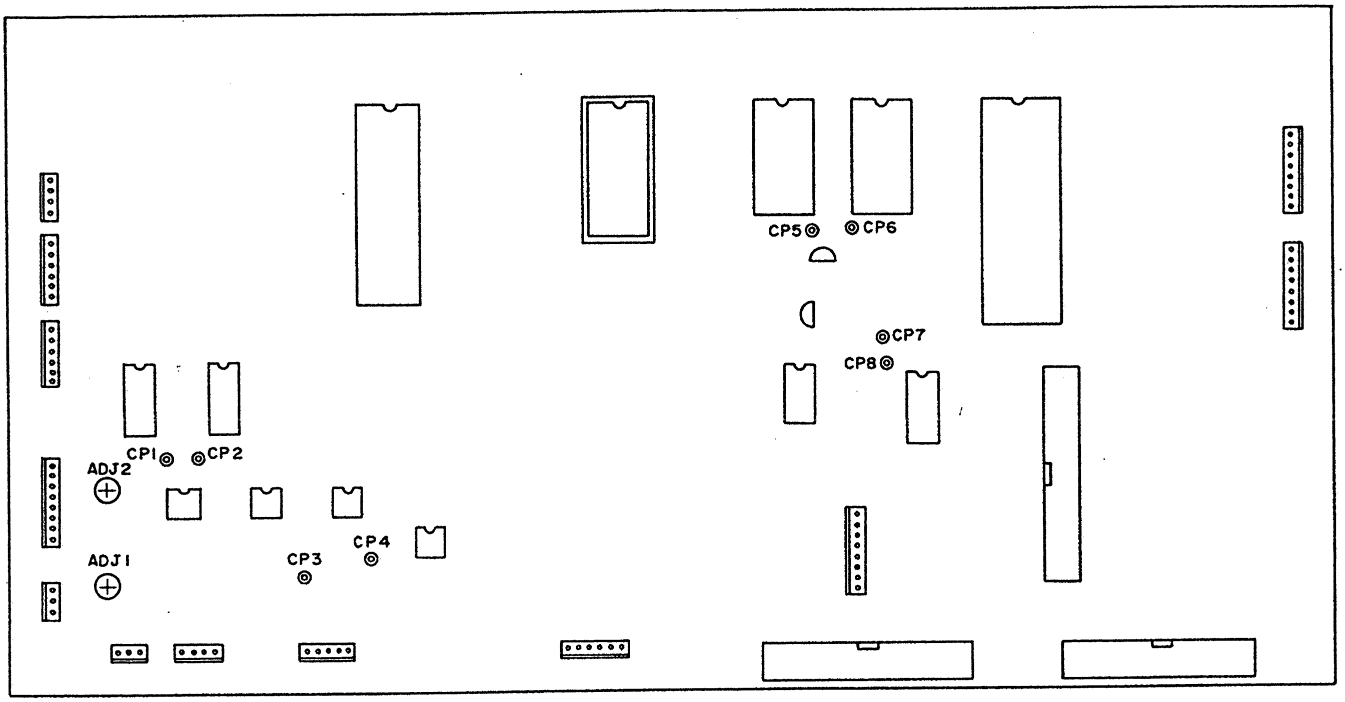
2-7 COMPÉD GAIN Adjustment

- Set the timbre to TEST-TONE 5.
- Connect the GND probe of the frequency counter to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ20 COMPÉD GAIN on the SYN-58 so that the frequency is 17 kHz ± 40 Hz.

2-8 VCA OFFSET Adjustment

- Set the timbre TEST-TONE 6.
- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP11 VCA.
- Adjust ADJ22 VCA OFFSET on the SYN-58 so that the AC component is minimized with the voltage range minimized.

CPU-06 Checking Points and Adjusting Points



CP1	Pressure Senser
CP2	Pitch Bender
CP3	Analog Ground
CP4	D/A Output
CP5	Battery Current Low
CP6	Battery Current High
CP7	Battery Voltage
CP8	Digital Ground

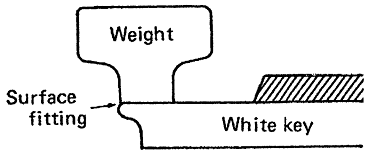
ADJ1	Pressure Sens Start
ADJ2	Pressure Sens End

3. AFTER SENSOR ADJUSTMENT (CPU-06)

- o Connect the GND probe of the oscilloscope to the AG terminal of the CPU-06 and the other probe to the CP1 pressure sensor.
- o Softly place a 600g weight jig on a white key with the greatest white key pressure resistance of the pressure sensor at a light load of 600g, then adjust ADJ1 Pressure Sense Start to cause 0 VDC on the oscilloscope.
- o Softly place a 1500g weight jig on a white key with the lowest white key pressure resistance of the pressure sensor at a heavy load of 1500g, then adjust the ADJ2 Pressure Sense End to cause 5 VDC on the oscilloscope.

Note: Finish your work quickly because the resistance may fluctuate if you leave a weight on a key for a long time.

Application of weight jig



4. BATTERY MOUNTING AND CHECK

- o Switch the power off, then set a battery insulation sheet and solder a battery with the legs cut.
- o Connect the GND probe of the digital voltmeter to CP8 DG on the CPU-06 and the other probe to CP7 Battery Volt, then check that the potential difference is 3.0 VDC or more (battery voltage).
- o Connect the GND probe of the digital voltmeter to CP6 Battery Current High on the CPU-06 and the other probe to CP5 Battery Current Low, then check that the potential difference is 0.2 mVDC or less (battery current).

Note: The battery current for detecting patterns and IC defects will normally fall within a measurable range.

5. OUTPUT LEVEL AND RESIDUAL NOISE

- o Load the data in the adjustable memory cartridge with the power switched on.
- o Set the timbre to TEST-TONE 1.
- o With a VTVM (Noise meter), measure the signal level at the maximum sound volume, and MONO OUT.
- o The output level shall be +4 dBm ±2 dB when six keys (C5, G4, C4, E3, G3, and C2) are pressed.
- o It shall be -71 dBm DIRECT or less when all keys are released and -71 dBm DIN AUDIO or less when all keys are released.

Thus, adjustment is completed.

Remarks:

How to fix the allocation of keys and channels (depending on kinds of key allocation):

a. Set the MONO switch to ON.
b. Press, then release any one key.
c. Reset the MONO switch to OFF.
d. Then, press and release keys C4, D3, E3, F3, G3, and A3 in sequence; the following correspondences will be established between the above keys and the channels unless another key is pressed:

C4 → CH1
D3 → CH2
E3 → CH3
F3 → CH4
G3 → CH5
A3 → CH6

K3 INSPECTION INSTRUCTIONS

Required Instruments and Materials:

- o Finished K3 product: 1 unit (SX-240 can be used as an alternate.) Used to check MIDI.
- o Monitor amplifiers: 2
- o 8-ohm headphones: 1 set
- o Memory cartridge for inspection: 1
- o Cables

1. PARAMETER FUNCTION CHECK

1-1 OSC1

- o Set the timbre to TEST-TONE 7.
- o Check that all the keys on the keyboard are free from abnormal musical intervals and timbres.
- o Check that OSC1 WAVEs 0 to 33 are free from abnormal timbres when several tones are keyed in over each octave.

Notes:

1. **Assure normality of the lowest tone (C).**
2. **Assure that WAVE 0 is soundless.**
3. **Check WAVE 32 for needless higher harmonics because it is set to "sine wave" by the user.**

1-2 OSC2

- o Set the timbre to TEST-TONE 8.
- o Check that all the keys on the keyboard are free from abnormal musical intervals and timbres.
- o Check that OSC2 WAVEs 0 to 33 are all free from abnormal timbres. Wave 0 shall be soundless.

1-3 BALANCE (1)

- o Set the timbre to TEST-TONE 9.
- o Check that little sound leaks even if a key is pressed in the above state.
- o Check that sound volume varies smoothly over the range from –15 to +15 of movement of the OSC BALANCE.

1-4 BALANCE (2)

- o Set the timbre to TEST-TONE 10.
- o Check that little sound leaks even if a key is pressed in the above state.
- o Check that sound volume varies smoothly over the range from –15 to +15 of movement of the OSC BALANCE.

1-5 PITCH BEND

- o Set the timbre to TEST-TONE 11.
- o Check that the pitch changes by 5 degrees upwards and downwards even if little force is applied after giving the bender wheel full swing vertically.
- o Check that a slight void of musical interval change appears at either end when the bender wheel is swung up and down slightly.

1-6 VCF KCV

- o Set the timbre to TEST-TONE 12.
- o Check that proper musical scales are formed with all the keys on the keyboard.

1-7 VCF ENV (1) (Slow)

- o Set the timbre to TEST-TONE 13.
- o Check that little unpleasant step noise sounds even when six or more keys are pressed and released in sequence on either (upper or lower) side of the musical intervals.

1-8 VCF ENV (2) (Fast)

- o Set the timbre to TEST-TONE 14.
- o Check that the timbres are free from dispersion even when six or more keys are pressed and released on either (upper or lower) side of the musical intervals.

1-9 LOW CUT

- o Set the timbre to TEST-TONE 15.
- o Check that low-band sounds go lower, then go out when more than one key is pressed at the same time.
- o Check that no distortion or needless sounds appear over the range from LOW CUT 0 to LOW CUT 31.

1-10 VCA

- o Set the timbre to TEST-TONE 16.
- o Check that sound volume varies smoothly and little step noise sounds over the range from VCA LEVEL 0 to VCA LEVEL 31.

2. MODULATING COMPONENT CHECK

2-1 LFO-VCF

- o Set the timbre to TEST-TONE 17.
- o Check that no extraordinary noise sounds when six or more keys are pressed and released on either (upper or lower) side of the musical intervals.

2-2 LFO-VCA

- o Set the timbre to TEST-TONE 18.
- o Check the effect by pressing several keys.
- o Check that no modulation noise sounds when all keys are released.

2-3 VELO-VCF

- o Set the timbre to TEST-TONE 19.
- o Check all the keys on the keyboard for changes in timbre between high and low key pressure. Also check that the keys are free from dispersion in timbre.

2-4 VELO-VCA

- o Set the timbre to TEST-TONE 20.
- o Check six or more keys for changes in sound volume between high and low key pressure.

2-5 PRES-VCF

- o Set the timbre to TEST-TONE 21.
- o Check any one key for setting key pressure, resetting key pressure, and smoothness.
- o Try pressing several keys with your right hand and check that no extreme difference in key pressure is felt as against the above one-key pressing.

2-6 CHORUS

- o Set the timbre to TEST-TONE 22.
- o Shall be free from soundless single or double channels when correct sounds are made on both (left and right) sides within the range from CHORUS 0 to CHORUS 7. Also check the effect.
- o Check that sounds flow rightwards at CHORUS 7.
- o With a headphone check that sounds flow rightwards similarly to the above.
- o Check that "monoral" is set with the R CHANNEL output removed. In other words, both direct and indirect tones shall be issued from the same amplifier.

3. MAXIMUM VOLUME CHECK

3-1 KCV = "15"

- o Set the timbre to TEST-TONE 23.
- o Set the LEVEL on the rear panel to L.
- o Tap, then press hard six high-tone keys on the keyboard at the same time. Repeat the above action several times and check that both (right and left) sides of the output develop the same sound volume and are free from distortion.

3-2 KCV = "–15"

- o Set the timbre to TEST-TONE 24 with the LEVEL on the rear panel set to L.
- o Repeat the action outlined in Section 3-1 several times at lower tones on the keyboard to check for distortion.

4. POWER ON/OFF NOISE AND TUNING CHECK

- o Switch the power on and off repeatedly to check that little unpleasant noise is generated.
- o Switch the power on about 10 seconds after switching it off to check the musical intervals against standard K3.

Notes: 1. Do not touch the bender wheel on this occasion.
2. Do not connect the MIDI cable on this occasion.

5. REAR PANEL COMPONENT CHECK

5-1 PROTECT Switch

- o Set the PROTECT switch to ON.
- o Press the WRITE and 1 keys with the INTERNAL indicator lamp on and check that PROTECT is indicated.

5-2 MIDI-THRU, -OUT, and -IN

- o Connect MIDI-OUT to MIDI-IN and MIDI-THRU to a standard K3.
- o Press the numeric switches on the panel in sequence to confirm that their corresponding numbers are indicated in the standard K3.
- o Switch the power on and off repeatedly to check that either K3 is free from abnormality.
- o Disconnected all MIDI connections.

5-3 RELEASE and PROG-UP

- o Connect a pedal to RELEASE to check performance.
- o Connect a pedal to PROG-UP to check performance.

6. INTERNAL TIMBRES

- o Check that CtrGEr is indicated when the MASTER and 50/LOAD keys are pressed.
- o Insert the cartridge containing the timbre data set at factory delivery, then load it by pressing the MASTER and 50/LOAD keys.
- o Remove the cartridge, then switch the power off and on.
- o Insert an unwritten memory cartridge and save its contents by pressing the MASTER and 49/SAVE keys.
- o Check that a cartridge of the same timbre is copied by pressing the CARTRIDGE key. But WAVE 32 is not copied in this case, therefore the timbre made from WAVE32 is difference timbre probably.
- o Conduct an overall test on 1 to 50 by pressing INTERNAL and check momentary changes of the sound volume variable resistor as well. The variable resistor should normally be set to its maximum.

DATA SETTING PROCEDURE AT FACTORY DELIVERY

Switch the power on when the lowest three keys *(C, C# and D) are pressed at the same time.
Thus, data setting at factory delivery into the internal memory is completed. *(F, F# and G) for Japan.

Parameter	Preset Value	Details
1 ~ 50		Internal timbres at factory delivery
40/RCV CH	1	MIDI Receive CH1
41/OMNI	1	MIDI OMNI ON
42/FUNCTION	6	
43/SEND CH	1	MIDI Send CH1
45/EXCLUSIVE 2	0	
LINK	1-4-7-10-13-17	
TUNE	0	Tuning frequency: 440Hz

CHECK POINTS FOR REPAIR

→N : No
→Y : Yes

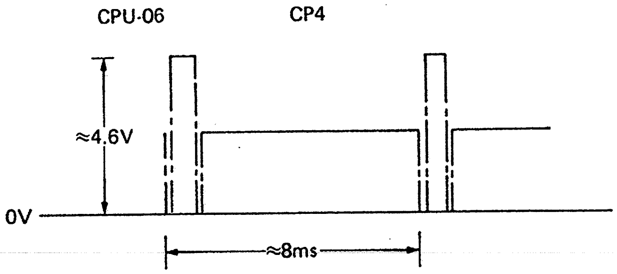
Check Points

A. No indication or sound is output.

o Is PC board CPU-06 supplied with 5V?
→N: PS-39, CPU-06, SYN-57,
SYN-58, JA-15, SW-138
Check each power supply.

o Is the quartz oscillator on PC board CPU-06 operating?
→N: CPU-06

o Is the CPU on PC board CPU-06 operating?
→N: CPU-06, PS-39
(Are analog voltage waveforms developing at CP4 of the CPU-06 repeatedly? →



B. Nothing responds to switch operations and no sounds are output, though some indication appears.
→Y: CPU-06
Key-Touch-Detect Circuit

C. Sounds are output, but indications are abnormal.
→Y: CPU-06, SW-138

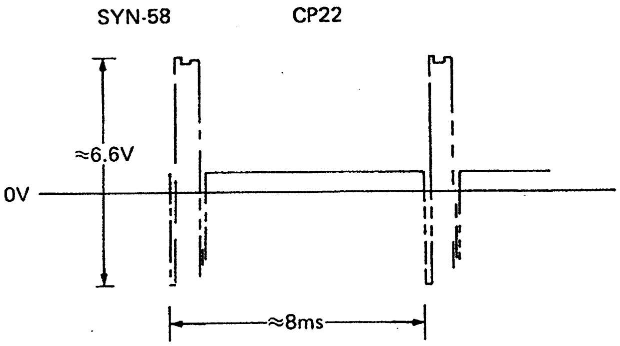
D. No programs could be written into INTERNAL.
→Y: CPU-06, JA-15

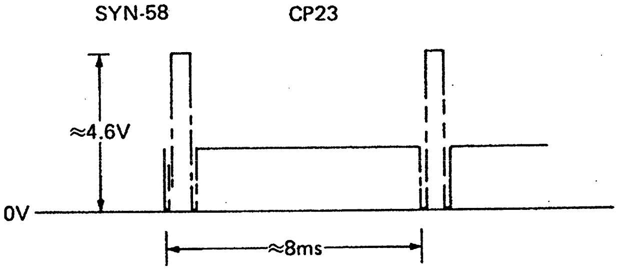
E. No sounds are output, though panel operations are proper.

o Is PC board SYN-58 supplied with +5V and ±15V?
→N: SYN-58, PS-39

o Are white noises made at TEST-TONE 1 and OSC1 WAVE 33?
→Y: SYN-57 See item F.
SYN-58 I7, I8, I5

o Are analog voltage waveforms developing at CP22 and CP23 of the SYN-58 repeatedly?
→N: SYN-58 I7, I9
CPU-06





o Are pulses developing at pins SELA, SELB, SELC, INH0, INH1, and INH2 of connector CN-5 on the SYN-58?
→N: CPU-06

o Does the voltage at CP19 of the SYN-58 fluctuate depending on programs?
→N: SYN-58 I21

o Are audio signals developing at CP27 of the SYN-58?
→N: SYN-58
Circuits before VCF

o Are audio signals developing at CP14 of the SYN-58?
→N SYN-58
Circuits before MIXER
SYN-58 I26
CPU-06
Key Touch Detect Circuit

o Are audio signals developing at CP11 of the SYN-58?
→N: SYN-58
Circuits before TOTAL VAC1
SYN-58 I28 ~ I32

o Are audio signals developing at I42 of the SYN-58?
→N: SYN-58
Circuits before LINE OUT AMP
SW-141 VOLUME

o Other than above? →Y: SYN-58 RELAY JA-15

F. No sounds are output over the range from WAVE1 to WAVE32 for OSC1 and OSC2, though white noises and VCF oscillation noises sound.

o Are SYN-57 clock pulses being input?
→N: CPU-06
Quartz oscillation circuit
SYN-57 I1, I8, I14, I20, I26

o Are SYN-57 channel separation signals developing at pins SINH, SHA0, SHA1, and SHA2 of connector CN-1 to the SYN-58? →N: SYN-57 I14, I31, etc.

o Are waveform addresses being issued from pins 1 to 8, 22, and 23 of I29 of the SYN-57?
→N: SYN-57 I15, I28, I32, I34, etc.

o Are waveforms being issued from pins WD10 to WD17 and WD20 to WD27 of connectors CN-1 and CN2 to the SYN-58 with the SYN-57 set to TEST-TONE 1?
→N: SYN-57 I1, I8, I14, I20, I26, etc.

o Other than above? →Y: SYN-58 I1, I2, I7, I8, I9, I29, I30

G. Improper WAVE musical interval?
→Y: SYN-57 I1, I2, I3, I8, I9, I10, I14, I15, I16, I20, I21, I22, I26, I27, I28

H. Improper WAVE musical interval common to OSC1 and OSC2

o Are all WAVEs improper?
→Y: SYN-57 I1, I4, I8, I14, I20, I26, I31, I32, I33, I18, I24, I25, I30, I34, I35

o Is a particular compass improper?
→Y: SYN-57 I1, I8, I14, I20, I26, I31, I32, I33, I34, I35, I25, I30, I12, I18, I24, I29

o Is a particular WAVE improper in timbre?
→Y: SYN-57 I4, I5, I11, I12, I18, I29, I24, I6, I17, I23

o Is only white noise characteristic improper for WAVE 33?
→Y: SYN-58 I33, I34, I35, 2SC3331T, I30, I31

I. There is a soundless channel among the six channels:

o Are waveforms being input to VCF?
(Check W1 to W6 of 47 Kohm connecting to pin 1st of I10 to I15 of the SYN58?)→N: SYN-58 I3, I4, I5, I6
SYN-57 I1, I8, I14, I20, I31

o Are audio signals developing at all channels (CP1 to CP6) of the SYN-58? →N: SYN-58 I10~I15, I19~I23

o Other than above? →Y: SYN-58 I24~I27
2SA798 (Any of six components)

J. Invalid parameters and their key points.

1. OSC1 (See the preceding item if common with OSC2.)
→Y: SYN-57 I20, I26, I11, I7, I13
SYN-58 I1, I8

4. BALANCE →Y: SYN-58 I1, I2, I8, I29, I30

5. PITCH SEND →Y: CPU-06 RC-4558, LM311P
PITCH-BEND VR

7. OSC2 (See the preceding item if common with OSC1.)
→Y: SYN-57 I20, I26, I5, I19
SYN-58 I2, I8

10. VCF OUTOFF

o Is the frequency higher or lower than normal?
→ Y: SYN-58 Adjust ADJ-19
I9, I21

o Is there a channel higher or lower in frequency than usual? →Y: SYN-58 ADJ13 ~ 18
I10 ~ I15, I19, I20, I22

11. Resonance

o Improper resonance characteristic with all channels?
→Y: SYN-57 I30, I28

o Is there a timbre-irregular channel?
→Y: SYN-57 ADJ1 1 ~ 6
I10 ~ I15

12. LOW CUT →Y: SYN-57 I30, I28, I38, 2SK304E, 2SA564R

13. VCF ENV

o Irregular timbre? →Y: SYN-57 I10 ~ I15, I19 ~ I22

o Is there a program ineffective throughout the channels?
→Y: SYN-57 I8, I9, I21

19. VCA LEVEL

o No sound volume change?
→Y: SYN-57 I39, 2SA564R, I29, I30

30. LFO VCA

o Does modulation noise leak even if no keys are pressed?
→Y: SYN-57 ADJ22, I38, I39, 2SK304E

31. VELO VCF
32. VELO VCA

o Improper velocity effect?
→Y: CPU-06 MB63H158, 6116ALSP–15x2
74HC153x2,
74LS09
KEYBOARD

33. PRESS OSC BAL
34. PRESS VCF
35. PRESS VCA

36. PRESS LFO-OSC

o Improper PRESS effect?
→Y: CPU-06
ADJ1: Setting pressure
(Weight at the first stage)
ADJ2: Resetting pressure
(Weight at the final stage)
I39, I40, I41
Keyboard

37. VCF-KCV

o Improper cutoff frequency variation with all channels
→ SYN-58 ADJ20, I7, I9, I21

(If a certain musical scale is obtained under the following conditions, as well as the TEST-TONE condition, it may be regarded as normal:)

1. OSC1 WAVE = 0
7. OSC2 WAVE = 0
10. CUTOFF = 50
11. RESONANCE = 31
37. KCV VCF = 14

o There is a channel with a different cutoff frequency variation. → SYN-58 I10 ~ I15

39. CHORUS

o Ineffective? →Y: SYN-58 I21, I23, I30, I31, I45, I46, I47, I48, I49, I50, I51, I53, I54, I55, I56, I57

o Distortion at CHORUS 0?
→Y: SYN-58 I46, I48, I52, I56

Note: Locate a defective channel among channels 1 to 6 as follows:
1. Set the MONO switch to ON
2. Press and release any one key.
3. Set the MONO switch to OFF
4. Irrespective of octaves

CH1 is located by pressing and releasing the C key.
CH2 is located by pressing and releasing the D key.
CH3 is located by pressing and releasing the E key.
CH4 is located by pressing and releasing the F key.
CH5 is located by pressing and releasing the G key.
CH6 is located by pressing and releasing the A key.

The above key assignment to channels is fixed unless another key is pressed or a switch is operated.

SPECIFICATION SHEET OF PERFORMANCE & FUNCTION

1. TYPE

6-Voice
Programmable
Digital Wave Memory Synthesizer

2. KEYBOARD

61 keys (5 octaves), C to C

3. PROGRAM

INTERNAL	(1 ~ 50)
CARTRIDGE	(1 ~ 50)
LINK	(max. 31)

4. EDIT

4.1 PARAMETER

OSC:

OSC 1 WAVE, RANGE, PORTA SPEED, BALANCE, PITCH BEND, AUTO BEND, OSC 2 WAVE, OSC 2 COARSE, OSC 2 FINE

VCF:

CUTOFF, RESONANCE, LOW CUT, ENV, ATTACK, DECAY, SUSTAIN, RELEASE

VCA:

LEVEL, ATTACK, DECAY, SUSTAIN, RELEASE

LFO:

SHAPE, SPEED, DELAY, OSC, VCF, VCA

TOUCH SENS:

VELO VCF, VELO VCA, PRES OSC BAL, PRES VCF, PRES VCA, PRES LFO-OSC

KCV:

VCF, VCA,

CHORUS

4.2 MASTER

MIDI:

RCV CH, OMNI, FUNCTION, SEND CH, EXCLUSIVE 1, EXCLUSIVE 2

WAVE:

HARMON/INTEN, COPY, ERASE

General:

SAVE, LOAD, TUNE

5. FUNCTION

WRITE, PORTAMENTO, MONO

6. ACCESSORY JACK

OUTPUT:

L/MONO, R

MIDI:

IN, OUT, THRU

HEADPHONE

FOOT SWITCH:

RELEASE, PROGRAM UP

7. OTHERS

VOLUME
INCREMENT
PROTECT switch: ON/OFF
LEVEL select switch: H/L
Memory Cartridge (with Protect Sw)

8. DISPLAY

double figures LED (x3)
PROGRAM/COUNT
PARAMETER/HARMONIC
VALUE/INTENSITY

9. RATING

AC	100	Volts
	117	
	110	
	220	
	240	
	50/60	Hertz
	38	Watts

KAWAI

Kawai Musical Instruments Manufacturing Co., Ltd.
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